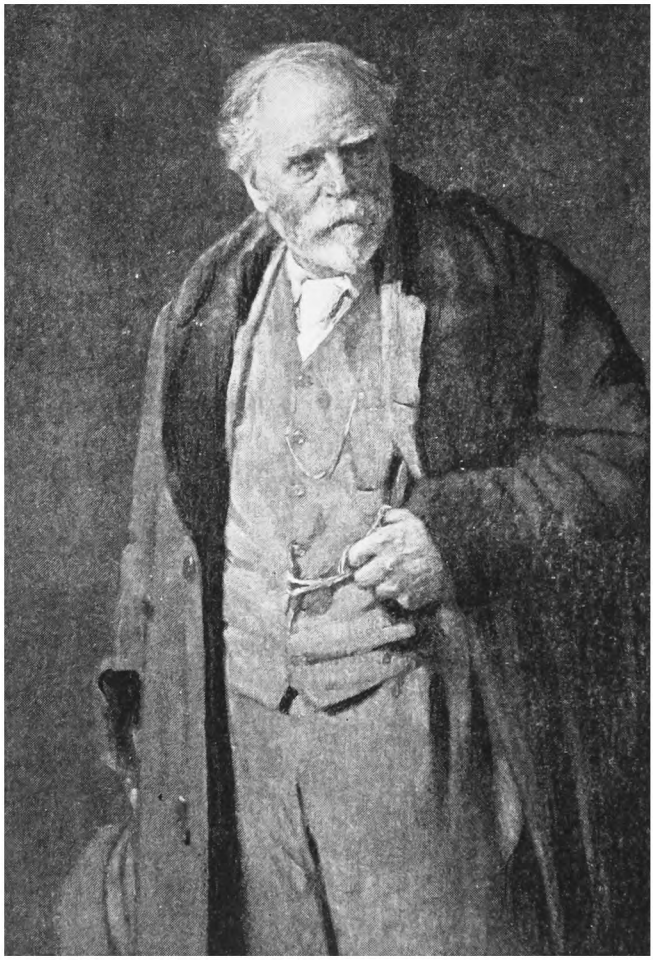

From a painting] *[by Sir George Reid, R.S.A.*

SIR JOHN MURRAY, K.C.B., F.R.S.
1841—1914.

SYMONS'S

METEOROLOGICAL

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No. 577. FEBRUARY, 1914. Vol. XLIX.

NOTES ON THE CYCLONE OF OCTOBER 27th, 1913, IN CHESHIRE.

By A. H. Hignett.

A storm which did an immense amount of damage passed through Cheshire at about 8.30 p.m. on October 27th. It was preceded, and accompanied by, very heavy rain, which, together with the lateness of the hour and small population of the district, may account for there having been no human casualties. The few people who heard it describe the sound as that of "hundreds of motor cars crashing through the trees." It lasted 4½ minutes, and its track was about 150 yards wide. It was accompanied by very vivid lightning, which ran about over the ground, and was said to be prismatic in colour. The wind is described as a "warm wind," whereas the wind in South Wales, where the cyclone occurred on the same afternoon, was said to be icy cold.

After doing much damage in the neighbourhood of Wem and Whitchurch, in the north of Shropshire, the cyclone, which was travelling in a due northerly direction, appears on entering the county of Cheshire to have risen into the air, and passed over about seven miles of country, most of which is covered with very fine timber, without doing any damage. It then pounced down on a single tree standing alone in a field near Bulkeley Grange, smashing it to pieces. It then rose again for a further 1¼ miles, doing no damage until it reached a farm at Peckforton Moss, which lies at the foot of the Peckforton Hills, a range of hills about 600 to 700 feet above sea level. On first returning to the earth it appears to have divided into two tracks, which passed on either side of the farm-house, destroying all the trees and buildings on each side, but leaving the house undamaged. These tracks joined again about half-a-mile or so further on, and the cyclone then travelled along the foot of the hills in a line parallel to them.

It was here that the worst damage was done. The country is thickly covered with very fine timber, and for a distance of over a mile hardly a single large tree was left standing in the track of the

cyclone, 150 yards wide, any small ones which were not uprooted having most of their branches torn off. One large uprooted tree was found in the centre of a field, and could not be identified; it had evidently been carried a considerable distance.

In several parts of the track of the cyclone the trees were laid down in *every* direction, which, with the way the tops were screwed off—many trees having only the trunks standing—would point to the "whirlwind" nature of the storm.

As the Church Stretton cyclone (referred to in your article on "The Weather of October") occurred at 8 p.m., and was apparently travelling north via Wem and Whitchurch, it might be the same cyclone which reached Cheshire (about 40 miles distant) at 8.30 p.m.

Several cows were lifted over a high hedge into an adjoining field, and three of them killed. Hen houses, pigsties and hay barns were carried away bodily, the galvanized iron sheets and the dead bodies of the hens being found hung up in the branches of the fallen trees.

The whole of the nearly new glass-houses and vineries in the gardens of Peckforton Castle, which lie in a very sheltered spot at the foot of the hill, were carried away, and some of the glass was found two miles further on, whereas, at the Castle itself, nothing was heard or known of the storm until the following morning.

The Castle stands on the top of the hill about 200 feet above and 400 to 500 yards to the west side of the track of the cyclone.

It then travelled past the foot of the rock on which the ruins of Beeston Castle stand, unroofing a farm on its eastern side, and continued in a northerly direction, doing much damage at Willington Hall, Kelsall, and eventually passed into Lancashire, near Runcorn.

THE WEATHER OF JANUARY.

DURING the first few days of the month the southern half of the British Islands was under the influence of a large anti-cyclonic system, while pressure was low in the vicinity of the Azores and in the far north. The month opened with low temperature, the shade minima on the 1st being as low as 10° at West Linton, 11° at Llangammarch Wells, 15° at York, 16° at West Witton, and 17° at Fulbeck, Marlborough, and Birr Castle; at Guernsey, on the other hand, the minimum did not fall below 34°. On the 3rd the influence of the high pressure system, which had receded over the Bay of Biscay, became reduced, and rain fell very generally over the western and northern districts. On the 4th a spell of unsettled weather set in which lasted till the 9th, during which time our islands were affected by deep cyclonic systems passing eastward at no great distance from our northern coasts. Gales were experienced almost daily on many parts of the northern and western coasts, with thunder-

THAMES VALLEY RAINFALL — JANUARY .1914.

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir

Rainfall Stations reporting •

Isohyetals

storms on the 5th and 6th in Ireland and Scotland. On the 4th heavy rain fell in many western districts, the maximum falls reported being 1·66 in. at Dungeon Ghyll, 1·36 in. at Carsphairn and 1·30 in. at Ottershaw. On the 8th, 2·1 in. fell at Stonyhurst, 1·8 in. at Lancaster, and 1·5 in. at Poltalloch, many other places in the west having falls ranging from an inch to an inch and a half. From about the 11th to the 23rd very little rain fell over the greater part of the United Kingdom, which was under the influence of a large anticyclonic system that had moved over our islands from Northern Europe. Temperature at the beginning of this period was above the normal, with maxima exceeding 50° in some southern districts, but later fell considerably. Easterly winds predominated, and in the north and east slight showers of snow and sleet were experienced. The lowest temperature occurred on varying dates. In Scotland the minimum values were mostly observed on the 21st or 22nd, the lowest recorded, all on the later date, being 15° at Balmoral, 16° at Fort Augustus, and 17° at Strathpeffer; in most other districts the minimum readings took place on the 23rd or 24th, temperature falling at Marlborough to 10° on the 23rd, and to 15° at Harrogate, Cirencester and Wisley, on the 24th. On this day temperature was high over Ireland and the N.W. of England, which was under the influence of a cyclonic disturbance located near Iceland; the shade maxima rising to 55° at Foynes, and to 54° at Birr Castle and Hawarden, while over practically the whole of Ireland the thermometer on this day rose above 50°. In the S.E. of England and the Channel Islands day readings continued low, the maximum at Hastings being only 36°.

Heavy rain fell on the 24th and 25th at many of the normally wet areas in the Lake District and the west of Scotland, the maximum amounts recorded being 2·85 in. at Seathwaite and 2·12 in. at Dungeon Ghyll on the 24th; 3·22 in. (in 12 hours) at Fort William, 1·75 in. at Loch Stack and 1·58 in. at Meggernie on the 25th. During the last week of the month southerly and westerly winds predominated, temperature being much above the normal in most districts. Rainfall was heavy in the north and east of Scotland, but in the east and south-east of England, which was dominated by the continental high pressure system, little fell. The highest temperatures recorded were 57° at Markree Castle on the 25th, and Hawarden Bridge on the 31st, on which day values of 56° in the shade were observed at many places in the N.E. of England, the Midland Counties and the south of Ireland. During the last three days of the month heavy rain fell in many northern and western districts, the maximum falls reported being 2·20 in. at Blaenau Festiniog, and 1·66 in. at Seathwaite on the 29th; 1·47 in. at Bendamph on the 30th; and 1·73 in. at Treherbert on the 31st.

The general rainfall of the month, expressed as a percentage of the average, was:—England and Wales, 67; Scotland, 92; Ireland, 61; British Isles, 73.

ROYAL METEOROLOGICAL SOCIETY.

THE annual general meeting of the Society was held on January 21st at the Institution of Civil Engineers, Westminster, Mr. C. J. P. Cave, President, in the chair.

In the report for the year 1913, the Council note a slight diminution in the number of Fellows. Among the losses by death are included M. Leon Teisserenc de Bort who was presented with the Symons Gold Medal in 1908, and Sir Wm. H. Preece, F.R.S., the eminent electrician of the Post Office who was elected a Fellow so long ago as 1862. The Joint Committee of the Society and of the British Association has continued its researches in the upper air and a brief report was made to the last meeting of the Association in Birmingham. The co-operation with the Meteorological Office in the preparation of a series of normal values of the climatological elements of the British Isles has been continued. Barometric pressure and wind direction were first dealt with and the Council has decided that on publication the pressure values shall be given in millibars, the question whether they shall also be given in inches being still under consideration. The additions to the library during the year included 284 volumes and 226 pamphlets, charts, etc. The report was adopted on the motion of the President.

Dr. Shaw proposed a vote of thanks to the Council for their work during the year. He referred to the new pressure units adopted by the Council, and said he had been pleased to note that the United States Weather Bureau had on January 1st commenced the publication of charts of barometric pressure for the Northern Hemisphere, on which the values were expressed in millibars.

The following gentlemen were elected to serve on the Council for the 1914 session. *President:* Mr. C. J. P. Cave, M.A.; *Vice-Presidents:* Dr. C. Chree, F.R.S., Dr. H. N. Dickson, Mr. E. Gold, Capt. H. G. Lyons, D.Sc., F.R.S.; *Treasurer:* Mr. F. Druce; *Secretaries:* Mr. F. Campbell Bayard, LL.M., Commr. W. F. Caborne, C.B.; *Foreign Secretary:* Dr. R. H. Scott, F.R.S.; *Councillors:* Mr. W. W. Byrant, Mr. R. H. Hooker, Mr. Baldwin Latham, C.E., Mr. R. G. K. Lempfert, Lt.-Col. H. Mellish, Mr. R C. Mossman, Col. H. E. Rawson, C.B., Hon. F. A. R. Russell, Mr. C. Salter, Capt. A. Simpson, Mr. G. I. Taylor, Commr. D. Wilson-Barker.

An interesting event in the evening's proceedings was the presentation of the Symons Gold Medal to Mr. W. H. Dines, F.R.S., in recognition of his distinguished work in meteorological science. The President spoke in glowing terms of Mr. Dines's valuable researches and especially his work with kites and pilot balloons in the investigation of the upper atmosphere. In returning thanks to the Society, Mr. Dines referred to his friendship with the late Mr. Symons, and reviewed the advances in meteorology in the past 30 or 40 years.

Mr. C. J. P. Cave delivered his Presidential address on "Upper Air Research." He described the way in which the upper air has

been explored in this and other countries. The first known experiments were made in 1749 by Dr. A. Wilson who raised thermometers by suspending them on a kite line. In 1847 kites were first flown at Kew Observatory in an endeavour to measure temperature and wind velocity in the upper air. It was not until 1895 that the Hargreave box-kite was evolved and this has since been used generally in most upper air experiments. Since the invention by Mr. Dines of a light meteorograph, valuable instrumental records have been obtained by means of small balloons of light fabric. At Manchester 24 balloons were sent up carrying Dines's meteorographs on one day at hourly intervals. Mr. Cave said that Great Britain was badly situated for upper air research as many balloons travelled out to sea and the records were in consequence lost. In the United States the late Lawrence Rotch induced the Weather Bureau to organize 17 stations for making upper air experiments and this soon became part of ordinary work of the American Observatories. Various instrumental means of obtaining records were described including Teisserenc de Bort's apparatus for collecting rarified air at great heights. To the late Teisserenc de Bort must be given the honour of having discovered the troposphere and the stratosphere though his results were at first received with some incredulity.

At the International Meteorological Conference, in 1896, it was decided to periodically fix certain days upon which ascents would be made simultaneously in various countries. More recently international weeks have been arranged, the first being held in July, 1907. Valuable contributions to the knowledge of the upper air conditions have been made by scientists in Russia, France and Germany. Germany posseses at Lindenberg the most complete upper air Observatory in the world. In 1912 there were made at Lindenberg 26 ascents of registering balloons, 262 of captive balloons, and 516 of kites.

The upper air has also been explored in the antarctic by Dr. G. C. Simpson, who accompanied the late Capt. Scott. Useful work has also been done by the Prince of Monaco on his arctic and other cruises.

Dr. Chree proposed a hearty vote of thanks to Mr. Cave for his address and for his services as President during the past year.

The following new fellows were elected:—Mr. Francis Anderson, Lieut. R. Cholmondeley, Mr. B. D. Cursett, B.Sc., B.A., Mr. Gilbert Dennison, Mr. H. E. Hurst, M.A., B.Sc., Mr. L. S. Powell, Capt. Robert Sunter, Mr. J. G. Sutherland, M.A.

SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of the Society was held in the Goold Hall, Edinburgh, on the evening of Monday, 26th January, 1914, when Mr. J. Mackay Bernard, B.Sc., President of the Society, presided over a large attendance.

Mr. A. Watt, Secretary to the Society delivered a Popular Lecture on "Ocean Currents and their Influence on Climate."

After a rapid outline of the development of our knowledge of ocean currents from the days of Columbus to the voyage of the "Michael Sars," the main facts as to the principal currents were summarised, and it was submitted that in sub-tropical regions the great currents had a direct influence on climate both as regards temperature and rainfall. Thus under the influence of the "return currents" of the North Atlantic and North Pacific the coasts of Morocco and of California had much cooler climates than the lands in the same latitudes on the western sides of the oceans.

There were marked similarities in the physical features of the great oceans, and these were very striking as regards the movements of their waters. Up the western coasts of South America, South Africa and Australia there flowed cold currents, which were not in any sense true antarctic currents, but were due to the uprising from lower depths of cool water to replace the warm waters driven off-shore by the powerful south-east Trade Winds. With these cold currents were associated practically rainless conditions along the shores washed by them. The Indian Ocean and China Sea were the only regions in which seasonal inversions of direction of currents occurred, and along the coastal fringe of Somaliland the air temperature was actually slightly less high in summer than in winter, as a consequence of the cold current which appeared off the coast to take the place of the warm water driven off-shore by the powerful South West Monsoon. Minor causes of currents such as convection movements and variations in salinity and density were discussed. Maury and his school had greatly over estimated such factors, and they were of importance chiefly in the case of partially enclosed seas. The great currents of the globe were determined by the prevailing winds. The Japan Current and the Gulf Stream were alone true ocean rivers, and the latter had entirely lost its momentum and had practically disappeared a little to the east of the Newfoundland Banks. The warm water that reached the shores of North-Western Europe was mere surface water driven across the Atlantic by the prevailing south-westerly winds which were themselves the main cause of the remarkable mildness of our climate. Any influence the Gulf Stream had on our climate was not direct as Croll and others had argued, but indirect. It was, of course, the Icelandic "low" in conjunction with the permanent "high" over the Azores that determined the frequency and strength of our south-westerly winds, and in so far as the intensity of that "low" depended on the surface temperature of the North Atlantic we had to take into account the contribution of warm water made by the Gulf Stream. It seems possible, however, that for any "long range" temperature forecasts for our islands we should look not to the Gulf Stream so much as to the Labrador Current which was a powerful factor in determining the temperature of the Atlantic surface waters.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

March 1st, 1911.

Starting Point.	Country.	A (H_c.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles.	F
Manchester.....	England ..	6·3	—71	11·9	—67	125	S.E. by E.
Brussels	Belgium ..	6·0	—60	16·4	?	78	S. by E.
Hamburg	Germany..	5·9	—47	14·4	?	53	E.N.E.
Lindenberg	„ ..	5·9	—57	8·6	—55	53	E.N.E.
Paris	France ...	6·5	—49	10·5	—53	109	E.
Munich	Germany..	7·5	—69	8·0	—68	269	E.
Pavia	Italy	7·1	—74	8·4	—69	58	E.
Pavlovsk	Russia	6·5	—81	8·4	—63	21	E.
Nishni Olchedaeff	„ ..	6·1	—53	7·6	—52	9	N.E.

March 2nd, 1911.

Manchester.....	England ..	7·3	—83	8·6	—63	138	S.E.
Petersfield	„ ..	6·9	—90	7·5	—91	417	E. by S.
Lindenberg.....	Germany..	5·3	—66	8·5	—51	56	S.E. by E.
Paris	France ..	6·4	—73	8·9	—60	119	E.S.E.
Munich	Germany..	5·7	—70	8·3	—54	108	S. by W.
Nizhni Olchedaeff	Russia	5·7	—58	6·9	—47	21	S.E.

March 3rd, 1911.

Manchester.....	England ..	6·9	—68	9·4	—54	141	S.E.
Brussels	Belgium ..	7·1	—92	8·3	—71	146	S. by E.
Lindenberg	Germany..	4·8	—54	8·5	—50	63	E.S.E.
Paris	France ..	6·8	—75	8·9	—64	111	S. by E.
Vienna.....	Austria ..	5·1	—61	6·5	—49	48	S.S.E.
Pavlovsk	Russia	4·7	—55	7·4	—42	30	E. by N.
Nishni Olchedaeff	„	5·2	—64	6·9	—47	14	N.N.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On the first a deep and extensive depression lay to the west of Norway and a high pressure over Russia, and another over Spain. On the second the whole northern system had moved eastward, and the Spanish anticyclone had extended to the Alps. The anticyclone had hardly moved on the third, but a very deep depression was rapidly approaching from Iceland.

The temperatures are very irregular, unusually high over Paris and Hamburg on March 1st, unusually low over England on the 2nd. There was a very general but irregular drift to the east and south-east, the most common direction over Europe for the drift of the upper atmosphere.

WIND GUSTS AND AERONAUTICS.

At a joint meeting of the Aëronautical Society of Great Britain, and the Royal Meteorological Society, held in the Royal United Service Institution, on January 7th, Major-General R. M. Ruck, C.B., R.E. (ret.), in the Chair, Dr. W. N. Shaw, F.R.S., delivered an Illustrated Address on "Wind Gusts and the Structure of Aerial Disturbances."

The subject being one of great interest and importance to practical aviators there was a good attendance. Dr. Shaw at the outset referred to the very great difficulty in handling the subject of the evening's discourse. He summarised the more salient features of the investigation as follows: "gusts are the expression of turbulent motion in the atmosphere. They are most conspicuous near the surface and may be attributed to the effect of obstacles, interposed in the path of moving air, which change the uniform motion of a steady current into pulsating motion with eddies. The most fully-developed form of eddy motion in the atmosphere is the cliff eddy. In other cases the vortices rapidly disintegrate, and so far the eddy motion has not lent itself to numerical measurement. Eddy motion is found in persistent forms and can arise spontaneously in the free atmosphere probably in consequence of thermal convection. The elements of eddy motion to be found in a line squall may give rise to temporary eddies with a vertical axis. Local convection in the atmosphere must inevitably give rise to local differences of pressure and hence to local winds which are shown in anemometers as recurring squalls. Consequently the causes and origin of recurring squalls should be looked for in the thermal changes due to local convection."

METEOROLOGICAL NEWS AND NOTES.

The Rev. H. A. Boys draws our attention to some remarkable sunsets which he has seen during the past winter. We shall be glad to have reports from other Observers who have any noteworthy optical phenomenon to describe.

Dr. W. N. Shaw, F.R.S., at the request of the Council of the Royal Society of Edinburgh, recently delivered an address on "Principia Atmospherica: a Study of the Circulation of the Atmosphere." A special appeal for the encouragement of the further study of the science of meteorology in "all seminaries of sound learning and particularly the Universities of this land" was made.

At Eastbourne, on Sunday, January 25th, Mr. J. C. Stenning reports that: "trees and other objects presented a peculiar greenish brown look, owing to their being covered with dust not due to road traffic. I put some of it under the microscope, and the examination showed it consisted of very fine sand grains. The dust came with a south-west wind."

THE UNITED STATES DAILY WEATHER MAP for January 1st, is accompanied by a notice stating that the U.S. Weather Bureau began on that date the publication of a weather map of the northern hemisphere, which will appear on the reverse side of the usual morning weather chart. In the specimen sent, the units of the C. G. S. system have been adopted. Pressures are expressed in millibars, and temperatures in absolute units. We further note that in the daily summaries, accompanying the Weekly Weather Report of the London Meteorological Office, references to air temperature over Europe have, since January 4th, been given in absolute units.

A BRILLIANT METEOR was seen on January 19th, at Farnham, Surrey, by Colonel Chrystie. "At about 7·5 p.m. there was suddenly a brilliant light. For a moment I thought a motor was coming up behind. Then I noticed a brilliant patch in the sky, N.W. about 75°; the sky being overcast. The light lasted a second or two, and must have been a meteor. I heard Farnham Parish Church strike seven a few minutes before. About 5 minutes later there was a peal of distant thunder, also in the N.W. The interval was so great that there can have been no connection between this and the light."

THE MAXIMUM SHADE TEMPERATURE in the Glaisher Stand at Camden Square has, at the time of writing, exceeded 50° on every day since January 29th, a sequence of 16 days. In the last 56 years the greatest number of consecutive days with shade maxima exceeding 50°, hitherto observed during the first eight weeks of the year, was 12, viz., from January 3rd to 14th, 1873.

THE MILDNESS OF THE WINTER is shown by the following, for which we are indebted to Mr. E. W. Harris, the High School, Malvern. "Your readers may be interested to know that 15 fully-ripe raspberries were gathered in the garden on December 12th last and strawberries were collected in the immediate neighbourhood on Xmas day. The following kinds of roses have been gathered in the open in Malvern during the month of January, viz., Gloire de Dijon, Maman Cochet, Dean Hole, Isabella Sprunt, Soeur de Marie de Zazay, Richmond, White Killarney, Madame Abel Chatenay, G. Nabonand, Frau Karl Druschki.

THE SOUTH ORKNEY RELIEF PARTY left Buenos Aires on January 13th. Observations at this important station—the most southerly observatory in the world—have now been carried on under Argentine auspices for ten years, the meteorological and magnetic work initiated by Dr. Bruce, of the *Scotia* expedition in 1903, having been taken over in February, 1904, by Mr. W. G. Davis, Director of the Argentine Meteorological Office. As no less than four antarctic expeditions will shortly be exploring in the Weddell Sea area, the combined meteorological and magnetic results will be of great interest and will throw much additional light on the weather problems of this region.

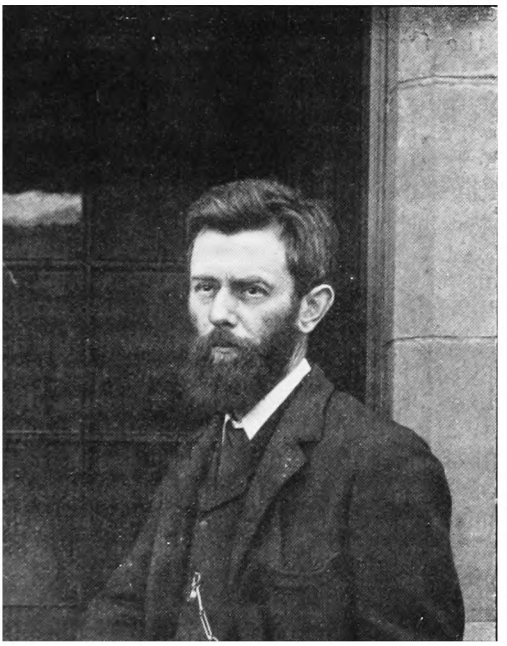
Robert Traill Omond, LL.D.

1858—1914.

By the death of Dr. R. T. Omond, which took place on the morning of January 27th, at his house in Edinburgh, at the comparatively early age of 55, the science of meteorology has lost one of its most earnest workers. Dr. Omond received his education at the Collegiate School of Edinburgh, and at the University. Although not pursuing any of the regular courses qualifying for degrees, he specialised in the study of physics under Prof. Tait, to whom he rendered invaluable assistance in the research work dealing with the compression of liquids, which arose out of the interpretation of the deep sea temperatures taken on the *Challenger* expedition. He also studied geology under Sir Archibald Geikie. In 1883, Dr. Omond became associated with the important enterprise which a year later resulted in the establishment of the famous Ben Nevis Observatory, of which he was installed Superintendent. During the succeeding eleven years he devoted himself in the most whole-hearted and self-sacrificing manner to the development of this great scientific undertaking. As automatic instruments were of no use during the greater part of the year, owing to the excessive humidity, frozen fogs and snowdrift, Dr. Omond initiated a system of hourly eye observations which were maintained night and day without interruption for a period of 20 years, until the closing of the observatories in 1904. Although a paid official under the Ben Nevis directors, he himself contributed towards the upkeep of the observatories sums far exceeding his small nominal salary.

Never of a robust constitution his health suffered under the continued strain of the rigorous climatic conditions prevailing on the cloud-capped summit, and in 1895 he was reluctantly compelled to give up work at the high level station, taking the title of Honorary Superintendent. On his return to Edinburgh, Dr. Omond, in conjunction with Dr. Buchan, gave all his time and energies to the working out of the many important problems which the wealth of Ben Nevis data rendered practicable. He prepared and saw through the press the four quarto volumes containing the detailed observations (*Trans. Roy. Soc., Edin.*, Vols. **36, 42, 43, 44**). In this work the main labour of proof correction rested with him, and, in addition to this self-imposed task, he contributed many papers to the appendices to these volumes and to the Journal of the Scottish Meteorological Society. His early training under Tait enabled him to bring to bear on his research work a full knowledge of fundamental physics, with which he was able to elucidate many of the atmospheric phenomena prevailing in the great laboratory of Nature. He became a Fellow of the Royal Society of Edinburgh in 1884, was awarded the Keith Prize in 1892, and served one term (1901-1904) on the Council. The honorary degree of Doctor of Laws was conferred on him at the summer graduation of 1913 by the University of Edinburgh.

Although the Ben Nevis enterprise absorbed much of his energies his wide scientific outlook caused him to have deep practical interests in many other directions. He was one of the most liberal supporters of the Scottish National Antarctic Expedition, and in spite of the burden of the Ben Nevis proof reading saw most of the papers dealing with the discussion of the *Scotia* Antarctic Meteorology through the press. Although suffering for years from a serious illness, his bright optimistic spirit continued unimpaired to the very end. When we saw him last, early in October, his appetite for work, despite the limitations imposed by physical disabilities, remained as



keen as ever, and he outlined at some length a heavy piece of research which he hoped to carry through during the winter.

Possessed of a genial, sympathetic, and happy spirit which to the last never failed him, he endeared himself to all. His influence over those who had the privilege of working with him in the early Ben Nevis days was enduring, and those who spent longer or shorter periods on the summit engaged in ordinary routine or special research, carried away lasting recollections of his unfailing courtesy and kindness, which made all visitors feel at home as his guests. He has left us an enduring example of tenacity of purpose and high ideals, combined with a simple, direct, and cheerful life which won the admiration and respect of his many friends. R. C. M.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

GLAZED FROST.

MAY I be allowed to add a contribution to the discussion on the above rather complicated subject; first with regard to the possibility of rain-drops being cooled below the freezing point without becoming solid. There seems to be every reason for supposing that this does take place, indeed they cannot freeze till they have been cooled some degrees below the freezing point as there is no solid surface in them of a nature of a freezing nucleus. I have no observations of the temperature of rain-drops during a glazed frost at low level, but I made some observations on cloud particles on the Rigi Kulm in 1892. At the time the temperature was 27° F. after a night minimum of 24°. In these conditions the particles seen falling on the micrometer were liquid. Previous to that date I had shown that artificially formed cloud particles were liquid though the temperature of the air in which they were condensed was 6° below freezing. Super-cooling of rain-drops will, therefore, be possible, as the condensation nucleus will not act in them, as it does not act in cloud particles, as a freezing nucleus; cloud particles being really very small rain-drops, and are constantly falling. Super-cooling may, therefore, in some cases take part in the formation of glazed frost, though it does not seem to be necessary in all cases. Mr. Dines explanation of rain-drops falling on surfaces cooled below 32°, and it may be formed even when the air temperature has risen above 32°, seems to be the explanation of most of the glazed frosts we have in this part of the world, but does not seem to explain what takes place occasionally here but more frequently elsewhere. For instance the thick coating of ice which sometimes forms on both small and large branches of trees, and even on grass stems, seem to require some other explanation, as the cooling effect of the twigs or the grass could not freeze a perceptible coating of ice. These cases would seem to require either super-cooling—would not "infra," "sub," or "subter," be a more correct prefix in this case—of the rain-drops, or else rain falling from a warm overstratum into a layer of air below 32° at the earth's surface.

In answer to Mr. Gold's question as to whether the freezing of a super-cooled rain-drop begins at its outer surface or not, the probability seems to be that it will begin at its outer surface, the start being given possibly by an angular speck of dust caught in the lower air by the falling drop, and once started ice spicules will almost instantaneously shoot through the whole drop, accompanied by a rise in its temperature to 32°.

JOHN AITKEN.

Ardenlea, Falkirk, 21st January, 1914.

I HAVE read Mr. Gold's letter with interest. The real point at issue in the present discussion is, I think, this :—rain drops or ice pellets, or a mixture of both, are falling at a time when apparently snow-flakes ought to be falling instead; why is this the case? To consider first the super-cooled water side of the question. If, as is no doubt usually the case in a typical glazed frost produced by rain-drops alighting on a frozen soil, the surface stratum of air through which the drops must fall is also at a temperature below the freezing point, it is, of course, quite possible that super-cooling will occur, and the calculations of Mr. Gold concerning the rate of cooling of falling rain-drops show, moreover, that it will be very probable. But what has meanwhile happened to the missing snow-flakes which ought to be falling in such cold weather? Either they were never formed at all in the condensation region, or else they were melted on the way down. Snow, I suppose all will be agreed, is the product of the crystallization of aqueous vapour out of the atmosphere, and it is almost inconceivable that liquid drops could freeze into such flakes. When once vapour is condensed (and the one sure criterion of condensation is the liberation of heat and not visibility) it must on freezing take a form much harder and more compact than snow, viz., hail, graupel or plain spherules—what I call "ice-rain."

Now it so happens, as Mr. Dines also pointed out, that the general meteorological conditions are usually such as to enable us very easily to account for the missing snow-flakes on occasions of glazed frost, or "silver thaw." A warm current overhead is either generating *rain* in the region of condensation, or melting the snow beneath that region. At the same time, of course, super-cooling, as we saw above, may be a secondary result in so far as the rain may fall through the cold surface air without freezing into solid pellets.

May not the difficulty which Mr. Gold has, in face of his calculations, in accounting for the readiness with which the drops escape solidifying, be explained by viscosity or friction?

On January 17th, 1912, we were not entirely robbed of our snow-flakes, and I think the large encrustations of ice upon twigs and branches, which were the characteristic feature of that rather remarkable and unusual type of glazed frost, must have resulted from the peculiar consistency of wet snow which fell in London on the night of the 17th (a time of deep snow in the Midlands).

I was quite mindful of the fact, drawn attention to by Mr. Gold, that the temperature on the afternoon of January 11th, 1913, when I observed the ice spherules, did not fall to freezing, but as the temperature was about 37° I did not regard the conditions of the phenomenon as essentially different, and concluded that only a little way up in the free air it would probably be below 32° in a layer beneath a warmer one, causing rain and cutting of the south of England from the north country snowstorm.

L. C. W. BONACINA.

Hampstead, N.W., January 20th, 1914.

THE STEVENSON SCREEN.

DURING the last 35 years I have been specially interested in the subject of thermometer screens, and have made frequent experiments thereon, one or two of the early results of which I showed to the late Mr. G. J. Symons many years ago.

I entirely endorse Mr. R. H. Curtis' defence, in your December number, of the Stevenson Screen and maintain, with Mr. John Aitken, that its disagreement with the north verandah readings of Mr. A. O. Walker is no indication of "error," but is, on the contrary, a point in its favour.

The "second top" protection against transmitted heat, mentioned by Mr. Aitken in your January number, has long been an essential part of the orthodox "Stevenson," as indeed, so far as I know, of any pattern of screen, and the underneath protection from reflected radiant heat is almost equally important.

As to the Scottish experiments mentioned in Mr. Aitken's letter, I am inclined to doubt the fairness of the artificial current of air for obtaining true shade temperature, and I do not agree that "Stevenson" readings, as such, are ever necessarily too high.

While, however, regarding the desirability of the Stevenson Screen for ordinary use as "chose jugée," I have, as the result of much labour, devised and constructed three others for use with (1) glass mounted thermometers, (2) "Alpine" thermometers for travellers, and (3) specially protected "pocket" thermometers, with all of which screens, notwithstanding their smallness and portability, I obtain readings closely approximating to those of the "Stevenson" itself.

WM. B. BUTLER.

Old Southgate, N., 19th January, 1914.

MAY I add a few remarks to the discussion on the Stevenson Thermometer Screen, and measurements of the air temperature. The first is that it is absolutely futile to use a thermometer hung *anywhere near a wall* for comparison with anything. The heavy mass of stone retains heat, and also cold, for a very long time. Consequently after any considerable change of temperature, objects within reach of its radiation will have their temperature very markedly affected. Some years ago, when living near Durham, I had a thermometer exposed on the wall of the house, the bulb being about 4 inches from the wall, and another at the end of the garden about 50 ft. distant, on the north side of an open trellis-work summer house. One evening after a heavy snowfall (in February, 1893, I believe) the sky cleared and a very severe frost set in. At 10 p.m. the thermometer on the wall read 13°; that at the end of the garden read 3°. If temperature had risen suddenly there would have been as great a difference the other way about.

My other point is that to attempt to measure the "temperature of the air" with great accuracy on a sunny day is to attempt the im-

possible, for it is attempting to measure a quantity which does not exist. The temperature of the air during sunshine is a thing of shreds and patches. No two adjacent masses of air then have the same temperature, nor does any one mass keep the same temperature for many seconds at a time. To prove this it is only necessary to attempt to use a large telescope for look-out purposes on a sunny day. I have two large astronomical telescopes, a 5 in. refractor and a $10\frac{3}{4}$ in. reflector. On a cloudy day these can be used with tremendous effect on distant terrestrial objects. At a mile I can see the separate florets of a daisy flower, small insects and spider threads on a hedge, &c. On a sunny day nothing can be seen but a dancing mass of confused air currents. The confusion is due to differences of temperature between closely adjacent air masses. The air at such times is a mixture of many temperatures and no thermometer is delicate enough to respond to the rapid and fitful changes of these. All that we can do is to get a fairly accordant mean. No contrivance for blowing air through can do any more. The accuracy which some of your correspondents are striving for is a spurious and fallacious accuracy. The effect of closing the bottom of the screen is merely to divert the current of heated air which rises from the sun-warmed ground. But if there is any breeze at all the same current from the ground to windward of the screen will be entering by the louvres on that side.

W. F. A. ELLISON.

Fethard-on-Sea, Waterford, January 21st, 1914.

SUDDEN FALL OF TEMPERATURE.

FOLLOWING upon the two remarkably warm days of January 9th and 10th, there occurred at midnight on the latter date a sudden and very brisk fall in temperature, amounting to 20° in eight hours, and accompanied by marked changes in humidity. The following table shows the two-hourly changes in temperature, and humidity as deduced from the hygrograph trace, a copy of which is enclosed herewith.

	Dry.	Wet.		Relative Humidity.
	°	°		%
January 10th, 12 p.m.	50	49	.....	93
,, 11th, 2 a.m.	42	40	.....	85
,, ,, 4 ,, ...	37	35	.....	83
,, ,, 6 ,, ...	33	31	.....	78
,, ,, 8 ,, ...	30	29	.....	83

There was a light and steady S.W. surface wind until 9 p.m. on the 10th, when it had become a very light westerly air. By 12.45 a.m. on the 11th a further change through N.W. to N. took place, finally becoming N.E. at 8 a.m. and moderate in force. At 4 p.m. on the 9th, during a very temporary period of partial clear sky, a rapidly moving cirrus current was noticed from the N.E. A black N.E. type of weather prevailed to the 22nd, with slight snow flurries at

times, very thick hoar frost setting in on the evening of that date, the grass radiation thermometer falling to 5° on the morning of the 23rd. Further thick rime frosts on the 23rd and 24th have been followed by a southerly wind with misty rain.

SPENCER C. RUSSELL.

Five Oaks, Billingshurst, Sussex, January 26th, 1914.

VISIBILITY.

HAVING observed and recorded Visibility since the year 1891, I may, perhaps, be able to make some reply to Mr. S. Miller's questions.

During the period mentioned, extreme visibility has been recorded at 9 a.m. on 83 occasions, and on 29 of them, or 35 per cent., measurable rain has fallen in the course of the following 24 hours. But the average number of rain days in the year, during the same period, has been 151, or 41 per cent. The phenomenon would, therefore, appear not to be a prognostic of rain, but rather the contrary.

As to the conditions which produce it, I do not venture to say anything, except that it seems to occur most frequently with north-easterly or easterly winds. Thirty-eight of the instances, nearly half, were with the wind between N. and E. This conclusion, however, can only be regarded as true locally. I believe that observations at stations situated S.W. of London show a totally different result.

H. S. TABOR.

Fennes, Braintree, 29th Dec., 1913.

LUNAR HALO.

AT 6.15 p.m. yesterday, Sunday, 4th January, I noted here a very clear and distinct rainbow coloured halo around the moon. There was a fresh wind blowing from the south at the time with fleecy white clouds drifting across the sky, but when first observed the sky was clear. The halo colours ranged from purple at the outer diameter to red, violet, orange and light green, the outside diameter of the halo being about 10 diameters of the moon's disc. The barometer at the time was 28·9 in., having fallen from 29·1 in. at 8 a.m., and the shade temperature 47°.

About half-an-hour afterwards the rings had extended in diameter somewhat, and the colouring was not so distinct as previously, and very soon after this the sky became too cloudy for observation.

During the night of the 4th, and early morning of the 5th the wind increased and became squally with rain at times. At 8 a.m. this morning, barometer steady at 28·6 in., with calm atmosphere.

HY. HULSE.

Engineer and Surveyor's Department, Droitwich, 5th January, 1914.

THE LARGE IONS OF THE ATMOSPHERE.

SOME recent discussions on the above subject have shown, among other things, that:—(*a*) A greater number of large ions are present in the atmosphere during moderate rain than during heavy rain; (*b*) A greater number of large ions are present during snow than during rain.

The similarity between the behaviour of the large ions and water or ice particles suggest that either they are identical, or that our methods of counting them do not distinguish between them. The latter seems to me the more likely, and may explain (*a*) and (*b*).

(*a*) Apart from the growth of water drops by condensation upon them as they fall, large numbers must coalesce. The greater the height at which the drops are formed the fewer will there be below a certain size by the time they reach the Earth. Consequently, there may be far more drops falling during moderate or low-formed rain than during heavy or high-formed rain. Obviously the heavy drop cannot masquerade as an ion, but we are not sure that the small drop cannot.

(*b*) Let there be two equal and separate regions in the atmosphere forming precipitation at equal rates—the one water and the other ice particles. These will start falling, and on the way to earth will experience many collisions. In the case of the water drops—apart from growth by condensation—a large percentage of the collisions will result in coalescence; whereas in the case of the ice particles a large percentage of the collisions will result in rebounds. Consequently after a time there will be far more ice particles below a certain size than water particles, and therefore a greater *apparent* "large ionisation" in the ice particle region.

It would be interesting to know if there is a greater apparent "large ionisation" during snow formed at comparatively low levels than in that formed at high levels. Also whether the maximum apparent "large ionisation" during rain and snow occurs early or late during the shower.

ALBERT GENDLE.

South Kensington, January 23rd, 1914.

NOVEMBER MILDNESS—AND AFTER.

IT has been asserted in the papers lately that mild Novembers are usually followed by cold winters; a fair number of examples have also been cited which, if typical, seem to bear out this theory.

Any predictions so far ahead is, of course, open to grave doubt, but, having Greenwich records for 1900—1911 inclusive and also for 1894—1895, I have attempted to find an approximate connection between the November mean and the coldness of the following winter, taken to be during December, January and February. I realise, of course, that any method using arbitrary periods must be approximate, so I must crave the indulgence of your readers.

The chief point is how to fix the intensity of the winter numerically. This might be done in four ways by—

(1) The total number of degrees of frost; (2) The number of frosts; (3) The mean frost intensity; (4) The mean duration of frost periods.

Any of the above considered alone reveal nothing when plotted to a base of November means. When, however, the product of (3) and (4) is plotted to the same base the result is quite different and a rough curve results, from which it is apparent that the higher a

	November Mean, Greenwich.	No. of Frost Days.	Degrees of Frost in Dec., Jan., Feb. following	Average Intensity.	Average Duration.	Product.
1895	46°4	54	39°2	7°26	5°4	39°2
1900	46·1	33	140·4	4·30	6·6	28·4
1901	40·9	37	159·3	4·03	2·6	11·2
1902	44·2	19	80·1	4·02	3·2	13·4
1903	44·1	30	98·0	3·27	3·7	12·1
1904	41·6	21	94·2	4·48	2·1	9·4
1905	41·1	24	78·0	3·25	2·4	7·8
1906	45·9	42	20·1	4·80	4·2	20·2
1907	44·8	25	14·8	5·87	2·8	16·4
1908	45·9	35	205·7	5·86	5·1	29·8
1909	41·7	28	101·6	3·62	2·0	7·2
1910	38·9	18	80·2	4·05	2·2	10·0
1911	43·8	14	87·2	6·23	2·5	15·5

November mean the colder is the following winter. To fix one's ideas, note the intense winter of 1894—95, with a value of 39°·2, following a November mean of 46°·4, and the mild winter of 1910—1911, with a value of 10°, following a mean of 38°·9.

It is interesting to note that the Greenwich temperature for last November was 48°·1, so that we should expect a very cold winter.

In conclusion, I should be very pleased if any of your readers thought it worth while testing this method with further values, and thus evolving perhaps a more scientific theory than mine.

C. RIDPATH.

THE SNOWDON GAUGE.

Col. Ward is doubtless sincere as to his friend's discovery of this gauge, but R. H. Scott in his "Meteorology," says it was invented by Quetelet and described by him in his "Climate of Belgium," published 1852.

JOHN J. GILBERT A.I.E E.

Crescent Wharf, Birmingham, January 19th, 1914.

THE IMPORTANCE OF A SNOWDON PATTERN GAUGE.

The recent heavy fall of snow, said to be the heaviest here for five years, has demonstrated in a striking way the importance of the deep funnel of a gauge of the "Snowdon" type. I set up a "British"

gauge in October by the side of a copper "Symons" gauge. The former and its measuring glass have British Rainfall Organization certificates, the latter has not, but its measuring glass though not certificated was supplied by Messrs. Negretti and Zambra, and seemed on comparison to agree fairly well with the other. The ring of the "British" gauge is 1 foot above ground, and that of the other 9 inches. I obtained the following readings:—

	British. in.	Symons. in.
December 28th	·11	·05
,, 29th	·42	·29
,, 30th	·18	·12

I admit the possibility of error in the figure ·05 in., though I think it unlikely, as I am most particular about writing down the quantity of water added to melt the snow, but the figures for the 29th and 30th are certainly right.

In the snow on January 4th and 5th I got the opposite effect:—

	Symons' Gauge. in.	British Gauge. in.
January 4th	·13	·12
,, 5th	·09	·07

The Symons is 9 ins. above ground, and the British 1 foot.

Under ordinary conditions the Symons' gauge reads somewhat higher, and it shows more "rain days" than the other. The copper gauge gave me more trouble to thaw than the British, owing to its freezing in the funnel more readily.

A. E. SWINTON.

Swinton House, Duns, Berwickshire, N.B.

DEPOSITS ON THE WET BULB.

The linen on my wet bulb thermometer occasionally has an appreciable deposit of green and colourless crystals mixed with specks of carbon. Being curious to know the composition I submitted one of the pieces of linen to an analyst and he found the following salts present, viz., copper sulphate, sodium sulphate, also traces of iron, arsenic and sodium chloride. The water used in the glass vessel belonging to the thermometer is *rain water* taken from the rain gauge. I am now using *distilled* water, and after the linen has been in use about 3 weeks I will have it examined to see if a deposit of similar nature has been formed.

A westerly wind brings smoke from passing steamers over this place, whilst a south-easterly wind may be slightly impregnated by chemically laden smoke from Widnes (some 15 miles distant).

It would be interesting to learn the results of similar investigations made by other readers.

H. MONTGOMERY, F.R.Met.Soc.

"Myra," Blundellsands, 8th January, 1914.

RAINFALL TABLE FOR JANUARY, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1914.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	1·83	·55
Tenterden	*Kent*	51 4	*0 41	190	2·14	·71
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·59	·56
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·75	·68
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	1·78	·49
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	1·89	·84
Shoeburyness	*Essex*	51 31	*0 48	13	1·33	·63
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·70	1·97
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·53	1·77
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·59	1·67
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·94	·84
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·33	·76
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·51	1·01
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·22	·88
Boston	*Lincolnshire*	52 58	0 1	11	1·54	1·63
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	1·70	·98
Macclesfield	*Cheshire*	53 15	2 7	501	2·66	2·36
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·55	1·57
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·26	5·68
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·89	1·11
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·70	1·85
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·90	2·13
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·44	12·13
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·65	2·11
Haverfordwest	*Pembroke*	51 48	4 58	90	4·69	2·24
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·91	3·70
Llandudno	*Carnarvon*	53 20	3 50	72	2·51	2·09
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·10	3·91
Marchmont House	*Berwick*	55 44	2 24	498	2·40	1·96
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·78	3·76
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·53	3·20
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·34	7·56
Mull (Quinish)	,,	56 34	6 13	35	5·55	4·69
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·01	1·45
Braemar	*Aberdeen*	57 0	3 24	1114	2·92	2·88
Aberdeen (Cranford)	,,	57 8	2 7	120	2·36	1·51
Cawdor	*Nairn*	57 31	3 57	250	2·28	2·53
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·58	3·98
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·42	10·11
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·75	3·35
Wick	*Caithness*	58 26	3 6	77	2·48	1·90
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·94	5·18
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·78	2·08
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	1·84
Ennistymon House	*Clare*	52 57	9 18	37	4·30	3·11
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·19	1·09
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·15	1·55
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·14	1·00
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·10	1·56
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·35	3·25
Cong (The Glebe)	,,	53 33	9 16	112	4·79	3·84
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·87	2·25
Seaforde	*Down*	54 19	5 50	180	3·41	1·58
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·19	1·89
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·46	2·52

RAINFALL TABLE FOR JANUARY, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
—1·28	30	·16	9	12	...	...	...	...	25·11	Camden Square
—1·43	33	·27	9	13	...	...	...	...	27·64	Tenterden
—2·03	22	·14	29	10	...	...	...	...	30·48	Patching
—2·07	25	·20	30	12	...	...	...	...	31·87	Cadland
—1·29	27	·21	4	9	...	...	...	...	24·58	Oxford
—1·05	45	·33	9	11	...	...	.	...	25·17	Croyland Abbey
— ·70	47	·29	9	11	...	...	...	...	19·28	Shoeburyness
+ ·27	116	·67	9	11	...	...	...	...	25·40	Westley
+ ·24	116	·69	10	17	..	...	...	...	23·73	Geldeston
—1·92	47	·34	3	16	...	...	...	...	38·27	Polapit Tamar
—2·10	29	·17	29	14	...	...	...	...	33·54	Rousdon
—1·57	33	·20	4	13	...	...	...	...	29·81	Stroud
—1·50	40	·27	4	12	...	...	...	...	32·41	Wolstaston
—1·34	40	·34	9	12	...	...	...	...	28·98	Coventry
+ ·09	106	·55	10	16	...	...	...	...	23·35	Boston
— ·72	58	·28	9	15	...	...	...	...	24·46	Hodsock Priory
— ·30	89	·44	4	16	...	...	...	...	34·73	Macclesfield
— ·98	62	·52	8	15	...	...	...	...	32·70	Southport
— ·58	91	1·01	4	21	...	...	...	...	61·49	Arncliffe
— ·78	59	·33	10	10	...	...	...	...	26·87	Ribston Hall
+ ·15	109	·43	10	18	...	...	...	...	26·42	Hull
+ ·23	112	·55	8	24	...	...	...	...	27·94	Newcastle
—1·31	90	2·85	24	15	...	...	...	...	129·48	Seathwaite
—1·54	58	·57	8	16	...	...	...	...	42·28	Cardiff
—2·45	48	·39	7	12	...	...	...	...	46·81	Haverfordwest
— ·21	95	·92	9	15	...	...	...	...	45·46	Gogerddan
— ·42	83	·53	9	15	...	...	...	...	30·36	Llandudno
— ·19	95	·95	24	16	...	...	...	...	43·47	Cargen
— ·44	82	·50	8	17	...	...	...	...	33·76	Marchmont
—1·02	79	·84	9	19	...	...	...	...	49·77	Girvan
— ·33	91	·48	4, 24	16	...	...	...	...	35·97	Glasgow
+ ·22	103	1·34	30	19	...	...	...	...	68·67	Inveraray
— ·86	85	·90	8	19	...	...	...	...	56·57	Quinish
— ·56	72	·35	9	15	...	...	...	...	28·64	Dundee
— ·04	99	·95	25	19	...	...	...	...	34·93	Braemar
— ·85	64	·38	8	18	...	...	...	...	32·73	Aberdeen
+ ·25	111	·70	25	12	...	...	...	...	29·33	Cawdor
—1·60	71	·93	25	15	...	...	...	...	44·53	Fort Augustus
+ ·69	107	1·47	30	19	...	...	...	...	83·93	Bendamph
+ ·60	122	·85	25	15	...	...	...	...	31·90	Dunrobin Castle
— ·58	77	·50	25	19	...	...	...	...	29·88	Wick
— ·76	87	1·26	31	20	...	...	...	...	54·81	Killarney
—1·70	55	·39	9	18	...	...	...	...	39·57	Waterford
—2·04	47	·40	31	14	...	...	...	...	39·43	Castle Lough
—1·19	72	·39	5	20	...	...	...	...	46·52	Ennistymon
—2·10	34	·19	9	14	...	...	...	...	34·99	Courtown Ho.
—1·60	49	·30	28	16	...	...	...	...	35·92	Abbey Leix
—1·14	47	·20	17	12	...	...	...	...	27·68	Dublin
—1·54	50	·35	4	15	...	...	...	...	36·15	Mullingar.
—2·10	61	·39	3	18	...	...	...	...	52·87	Enniscoe
— ·95	80	·66	8	16	...	...	...	...	48·90	Cong
—1·62	58	·33	26	16	...	...	...	...	42·71	Markree
—1·83	46	·30	5	15	...	...	...	...	38·91	Seaforde
—1·30	59	·40	5	14	...	...	...	...	37·56	Dundarave
— ·94	73	·45	4	17	...	...	...	...	39·38	Omagh

SUPPLEMENTARY RAINFALL, JANUARY, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road..	·92	XI.	Lligwy	2·27
,,	Ramsgate	1·15	,,	Douglas	2·80
,,	Hailsham	·87	XII.	Stoneykirk, Ardwell House...	3·03
,,	Totland Bay, Aston House...	·45	,,	Dalry, The Old Garroch.....	5·45
,,	Stockbridge, Ashley..	·52	,,	Beattock, Kinnelhead	5·60
,,	Grayshott	·82	,,	Langholm, Drove Road	5·22
III.	Harrow Weald, Hill House...	·76	XIII.	Meggat Water, Cramilt Lodge	3·09
,,	Caversham, Rectory Road ...	·67	,,	North Berwick Reservoir.....	2·04
,,	Pitsford, Sedgebrook.....	·95	,,	Edinburgh, Royal Observaty.	2·12
,,	Woburn, Milton Bryant.....	...	XIV.	Maybole, Knockdon Farm ...	3·32
,,	Chatteris, The Priory..... ...	1·56	XV.	Ballachulish House	6·51
IV.	Elsenham, Gaunts End	1·08	,,	Campbeltown, Witchburn ..	3·73
,,	Colchester, Hill Ho., Lexden	1·41	,,	Holy Loch, Ardnadam.....	7·03
,,	Ipswich, Rookwood, Copdock	1·49	,,	Islay, Eallabus	3·68
,,	Blakeney..... .	1·88	,,	Tiree, Cornaigmore	3·25
,,	Swaffham	1·67	XVI.	Dollar Academy	3·11
V.	Bishops Cannings	·59	,,	Balquhidder, Stronvar.....	7·22
,,	Wimborne, St. John's Hill ...	·67	,,	Glenlyon, Meggernie Castle..	6·15
,,	Ashburton, Druid House.. ...	1·62	,,	Blair Atholl	3·00
,,	Cullompton	·86	,,	Coupar Angus	1·79
,,	Lynmouth, Rock House	2·36	,,	Montrose, Sunnyside Asylum.	1·47
,,	Okehampton, Oaklands.. ...	2·44	XVII.	Alford, Lynturk Manse	1·38
,,	Hartland Abbey.....	2·16	,,	Fyvie Castle	1·66
,,	Probus, Lamellyn.....	1·42	,,	Keith Station	3·44
,,	North Cadbury Rectory.....	·75	XVIII.	Alvey Manse.....	...
VI.	Clifton, Pembroke Road.....	1·33	,,	Loch Quoich, Loan	15·10
,,	Ross, The Graig	·67	,,	Drumnadrochit	4·56
,,	Shifnal, Hatton Grange.....	1·16	,,	Skye, Dunvegan	6·30
,,	Droitwich.....	·71	,,	Lochmaddy Bayhead	...
,,	Blockley, Upton Wold.....	·88	,,	Glencarron Lodge	10·28
VII.	Market Overton.....	1·48	XIX.	Invershin	2·01
,,	Market Rasen	1·07	,,	Melvich	3·34
,,	Bawtry, Hesley Hall	·88	,,	Loch Stack, Ardchullin	8·26
,,	Derby, Midland Railway.....	1·50	XX.	Skibbereen Rectory	3·51
,,	Buxton	3·29	,,	Dunmanway, The Rectory ..	4·86
VIII.	Nantwich, Dorfold Hall	1·79	,,	Glanmire, Lota Lodge, No. 1	2·28
,,	Chatburn, Middlewood	3·51	,,	Mitchelstown Castle.....	2·08
,,	Cartmel, Flookburgh	4·13	,,	Darrynane Abbey.....	3·59
IX.	Langsett Moor, Up. Midhope	2·81	,,	Clonmel, Bruce Villa	1·66
,,	Scarborough, Scalby	2·33	,,	Newmarket-on-Fergus, Fenloe	2·07
,,	Ingleby Greenhow	1·61	XXI.	Laragh, Glendalough	2·04
,,	Mickleton	4·20	,,	Ballycumber, Moorock Lodge	1·28
X.	Bellingham, High Green Manor	3·32	,,	Balbriggan, Ardgillan	·88
,,	Ilderton, Lilburn Cottage ...	1·87	XXII.	Woodlawn	2·71
,,	Keswick, The Bank.....	4·21	,,	Westport, St. Helens	2·83
XI.	Llanfrechfa Grange	1·81	,,	Dugort, Slievemore Hotel ...	4·37
,,	Treherbert, Tyn-y-waun	8·26	,,	Mohill Rectory	2·85
,,	Carmarthen, The Friary	2·96	XXIII.	Enniskillen, Portora.....	2·34
,,	Castle Malgwyn [Llechryd]...	2·00	,,	Dartrey [Cootehill]	1·63
,,	Crickhowell, Tal-y-maes.....	3·00	,,	Warrenpoint, Manor House ..	1·29
,,	New Radnor, Ednol	...	,,	Banbridge, Milltown	1·10
,,	Birmingham WW., Tyrmynydd	4·93	,,	Belfast, Cave Hill Road	3·10
,,	Lake Vyrnwy	...	,,	Glenarm Castle..... ...	2 85
,,	Llangyhanfal, Plâs Draw.....	2·02	,,	Londonderry, Creggan Res...	2·23
,,	Dolgelly, Bryntirion.....	7·16	,,	Dunfanaghy, Horn Head ...	3·26
,,	Bettws-y-Coed, Tyn-y-bryn...	5·39	,,	Killybegs	4·36

METEOROLOGICAL NOTES ON JANUARY, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The driest January since 1892, when the R was ·50 in., but with a marked deficiency of sunshine. There were only 12 days with recorded sunshine, and of these only 4 had so much as 2 hours, Mean temp. 38°·2 or 0°·3 below the average. Duration of sunshine 15·7* hours. and of R 24·7 hours. Evaporation ·09 in. Shade max. 55°·6 on 9th; min. 20°·9 on 24th. F 16, f 23.

TENTERDEN.—A dry month, and the coldest January since 1908. Duration of sunshine 53·0† hours. Shade max. 54°·0 on 9th; min. 18°·0 on 24th. F 17, f 22.

TOTLAND BAY.—The least R for January in the past 26 years. Duration of sunshine 59·7* hours or 11·6 hours below the average. Mean temp. 38°·6 or 2°·1 below the average. Shade max. 51°·0 on 10th; min. 24°·8 on 24th. F 13, f 21.

PITSFORD.—Mean temp. 36°·7. R ·71 in. below the average. Shade max. 49°·3 on 4th; min. 19°·3 on 24th. F 17.

IPSWICH, COPDOCK.—A dull, dry month, excepting from 8th to 10th. Mean temp. 36°·3. Duration of sunshine 43* hours. Shade max. 55°·4 on 9th, the highest temp. recorded in January in 13 years; min. 22°·3 on 24th. F 16, f 24.

POLAPIT TAMAR.—Cold, sunless and dry. Shade max. 54°·6 on 10th; min. 19°·0 on 1st. F 13, f 18.

NORTH CADBURY.—The driest January in 18 years. An absolute drought lasted from 10th to 25th. On the 13 days from 11th to 23rd temp. never reached 40°, but the night frosts were not severe. Shade max. 54°·8 on 9th; min. 21°·5 on 1st. F 15, f 21.

WOLSTASTON.—Very cold from 11th to 25th, with E. wind, but mild and damp after.

HODSOCK PRIORY.—A dry, open month, with a good deal of calm, anticyclonic weather. Shade max. 54°·9 on 9th; min. 11°·4 on 1st. F 12, f 26.

SOUTHPORT.—Dry, but exceptionally dull. Duration of R 53·7 hours, and of sunshine only 26·1* hours or 19·2 hours below the average. Mean temp. 39°·3. Evaporation ·07 in. Shade max. 54°·0 on 31st; min. 22°·0 on 1st. F 11, f 19.

HULL.—Dull and cheerless generally. Cold periods, with sleet and S to 24th, then mild to the end. Duration of sunshine 21·8* hours. Shade max. 54°·0 on 31st; min. 23°·0 on 5th. F 9, f 21.

HAVERFORDWEST.—Fine and mild generally. Gales on 3 days. Duration of sunshine 39·0* hours. Shade max. 54°·1 on 25th and 31st; min. 21°·9 on 1st. F 10.

BETTWS-Y-COED.—Shade max. 63°·0 on 10th; min. 20°·0 on 1st.

CARGEN.—A week of unsettled weather from 4th to 10th, followed by a fortnight of fine but somewhat cold weather. A change of wind to the S. on 23rd brought with it another wet period accompanied by high winds. Farm work well advanced. Pastures extraordinarily green for mid-winter.

EDINBURGH.—Shade max. 53°·1 on 25th; min. 24°·9 on 1st. F 8, f 23.

LYNTURK.—Remarkably open weather. Mild at the beginning. R considerably below the average. Shade max. 53°·5 on 30th; min. 17°·0 on 21st. F 22.

LOCH STACK.—Duration of sunshine 19·3* hours.

DUNMANWAY.—Little R until 23rd, except on nights 7th, 8th and 9th. Dry, hard weather with E. winds prevailed. Wet and milder after 23rd. Wild and stormy on night of 30th and on 31st.

MARKREE.—The finest January for many years, with the lowest R.

KILLYBEGS.—Fine on the whole, with strong winds. Cold between 11th and 22nd.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, August, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	82·6	28	45·2	25	72·2	53·2	53·7	78	127·3	43·6	1·43	11	6·7
Malta	93·9	20	67·9	17	82·6	71·8	...	71	146·8	..	·02	1	2·5
Lagos	86·2	*22	70·3	5	84·0	74·3	72·4	79	155·2	68·3	2·48	16	...
Cape Town	71·9	8	40·7	2	63·8	50·3	51·0	80	...	...	3·76	8	5·1
Natal, Durban ...	71·0	†23	49·0	‡15	67·0	58·1	56·5	78	...	...	7·12	5	5·0
Johannesburg	77·8	§ 21	27·5	14	68·2	45·5	35·5	59	132·0	26·8	·91	3	1·9
Mauritius	77·2	29	52·4	1	74·5	61·3	59·6	76	139·0	45·1	2·17	17	5·1
Bloemfontein	80·5	22	27·9	14	68·1	41·8	35·0	58	...	...	·36	3	3·7
Calcutta...	92·1	3	76·5	7	88·1	78·6	77·0	85	...	75·5	13·40	18	8·3
Bombay...	87·1	30	74·9	21	84·9	77·8	75·1	82	133·9	71·3	3·47	22	7·4
Madras	102·4	3	75·5	20	97·6	79·9	70·3	62	145·7	74·0	·72	9	6·5
Colombo, Ceylon ...	87·5	26	72·2	21	85·2	76·5	73·2	78	152·7	69·7	·64	6	7·2
Hongkong	92·0	16	74·9	17	86·5	77·7	76·1	84	...	...	10·57	15	5·8
Sydney	76·9	30	41·0	15	63·5	47·8	39·6	56	123·0	29·0	·11	7	2·8
Melbourne	65·7	29	30·7	14	57·0	44·5	41·4	68	113·3	26·5	1·85	21	6·8
Adelaide	74·8	14	39·7	31	63·9	47·9	43·3	64	132·0	31·1	2·11	17	5·0
Perth	67·6	31	39·9	20	62·1	48·0	47·6	75	139·1	32·9	9·89	26	5·9
Coolgardie	76·8	26	33·0	3	64·0	42·7	40·4	58	141·6	28·0	·66	6	3·2
Hobart, Tasmania ..	64·5	28	31·9	15	54·1	41·1	37·7	64	111·5	26·4	1·44	22	6·5
Wellington	62·4	23	36·2	9	55·0	44·5	43·8	80	117·6	28·0	4·30	25	7·5
Auckland	62·0	6	40·0	30	57·7	48·3	47·6	82	129·0	35·0	5·78	23	6·3
Jamaica, Kingston ..	93·2	26	70·8	19	89·8	73·2	71·2	77	...	...	1·08	11	4·0
Grenada	87·0	13	71·0	8	84·7	71·3	...	74	138·0	...	9·44	25	5·5
Toronto	92·0	‡17	42·2	25	78·8	58·5	56·5	70	...	...	2·27	9	3·6
Fredericton	86·5	16	36·0	26	74·2	51·0	...	76	...	...	4·02	9	4·2
St. John, N.B. ...	77·2	10	47·2	26	65·5	54·4	54·0	82	...	...	2·76	12	5·4
Edmonton, Alberta ...	83·8	3	41·0	19	71·0	49·6	...	73	141·8	35·5	4·41	17	5·1
Victoria, B.C.	85·8	1	46·0	19	72·1	53·0	52·0	71	...	...	·84	3	4·7

* 24, 27. † 26, 27, 30. ‡ 16. § 22.

Johannesburg.—Bright sunshine 298·5 hours.

Mauritius.—Mean temp. of air 0°·3 below, dew point 0°·4 above, and R ·31 in. below, averages. Mean hourly velocity of wind 12·4 miles, or ·1 above average.

Bloemfontein.—The warmest August since observations have been taken here.

COLOMBO.—Mean temp. of air 80°·9, or 0°·3 below, of dew point 0°·1 below, and R 2·29 in. below, averages. Mean velocity of wind 6·3 miles per hour.

HONGKONG.—Mean temp. of air 81°·6. Mean hourly velocity of wind 8·7 miles. Bright sunshine 197·8 hours.

Sydney.—Dry and frosty month.

Melbourne.—Mean temp. of air 2°·4 above, and R ·04 in. above, averages.

Adelaide.—Mean temp. of air 2°·1 above, and R ·39 in. below, averages.

Coolgardie.—Temp. of air normal.

Hobart.—Temp. of air normal and R ·39 in. below, averages.

Wellington.—Mean temp. of air 1°·3 below, and R ·36 in. below, averages. Bright sunshine 115·0 hours.

Auckland.—Wet and stormy, R on 23 days. Gales on 12th, 20th, and 25th.

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Meteorological Magazine.

No. 578. MARCH, 1914. Vol. XLIX.

ROYAL METEOROLOGICAL SOCIETY.

The fourth meeting of the Society during the present session was held on February 18th at the Institution of Civil Engineers, Westminster, Mr. C. J. P. Cave, President, in the chair.

Dr. W. N. Shaw, F.R.S., read a paper on the "Interpretation of the Results of Soundings with Pilot-Balloons." The author pointed out that the paper was an extension of two previous communications, one a paper recently published by the Scottish Meteorological Society, and the second a paper communicated to the Royal Society of Edinburgh on December 1st, 1913. He had taken in the present instance several types of atmospheric structure given in Mr. Cave's book, and computed from the results of soundings with pilot-balloons the pressure and temperature differences per 100 kilometres in the north-south line and east-west line at successive kilometre levels. When irregular fluctuations in the wind velocity were found, corresponding irregularities in temperature and pressure differences must be looked for at the successive levels, these irregularities being obvious characteristics of the observations of wind velocity, pressure difference and temperature difference.

The President expressed thanks to Dr. Shaw for his masterly paper, and said it would be interesting to carry this research further, and see if irregularities of wind velocity cause irregularities of temperature, or if the irregularities of temperature were the cause of irregularities in wind velocity.

Mr. Gold, Mr. R. H. Hooker, and Major W. S. Brancker also took part in the discussion, and Dr. Shaw replied.

Mr. G. M. B. Dobson, B.A., F.R.Met.Soc., read a paper on the "Pilot-Balloon Ascents at the Central Flying School, Upavon, during the year 1913." The results taken from 97 ascents in which the balloons reached a greater height than 1000 metres were dealt with. It was found that the direction of the wind veers from, and its velocity increases with, increasing height above the ground, until the gradient direction and velocity are reached. The mean increase, however, is considerably less rapid than would be given if we assume the wind to increase as the height above sea-level. The gradient velocity is usually reached at a height of 300 metres above the surface; though the gradient direction is not found until a height of about 800 metres. At higher altitudes the velocity tends to increase, and the direction continues to veer, slightly beyond the gradient

velocity and direction. The ascents were divided into three groups, according as the wind at 650 metres was light (below 4·5 metres per second), moderate (between 4·5 and 13 metres per second), or strong (above 13 metres per second). The light winds show little increase of velocity with height; and they do not seem to have quite reached the gradient velocity below 1000 metres. The moderate winds attain the gradient velocity at 300 metres, but the strong winds at 500 metres, also the increase of velocity is greater for strong than for moderate winds. If the surface velocity be expressed as a percentage of the upper wind, the value so found decreases with increasing strength of wind. Thus for light winds the surface velocity is 87 per cent. of the wind at 650 metres, for moderate winds 64 per cent., and for strong winds 56 per cent. Light winds also show considerably less change of direction with height than do moderate and strong winds. It was found that the moderate winds went on veering considerably after the gradient direction was reached.

The ascents were divided into four groups according to wind direction, the results being fairly uniform up to 1,300 metres, above which height the north-east winds fell off.

The conditions in the early morning and about the middle of the day were also considered, from which it was shown that in the early morning the increase of velocity with height was much more rapid then than in the middle of the day, the increase being greater in spring than in summer.

Dr. W. N. Shaw complimented the author on showing the results of individual ascents on the same diagram.

Mr. Whipple said that the fact that the N.E. wind fell off as the balloons reached greater heights was a good illustration of a point in Dr. Shaw's paper. He had been much interested in the earlier diagrams showing a large number of cases in which the wind behaved peculiarly at lower altitudes.

Mr. C. J. P. Cave, Mr. J. E. Clarke and Mr. G. S. Taylor also took part in the discussion, and Mr. Dobson replied.

The following new fellows were elected:—Mr. P. Arnold Bernard, Mr. A. F. Sharman Crawford, Rev. Canon A. M. Deane, M.A., F.R.A.S., Mr. W. W. Goudie, Mr. E. H. Hankin, M.A., D.Sc., Mr. G. S. Lowe, F.R.G.S., Capt. Seaton Massy, Capt. G. F. Mead, Sir Ismail Sirry, Pasha, K.C.M.G., and Mr. John Woodrow, Junr.

THE BRITISH RAINFALL ORGANIZATION is arranging an exhibit in the Science Section of the Anglo-American Exposition.

It is wished to compare the instruments employed for measuring rainfall in use 100 years ago, with those of to-day.

Any Observers who have rain gauges of the 1814 period, or any earlier date, who would care to lend them for the purpose, are requested to communicate with the Director of the British Rainfall Organization at 62, Camden Square, London, N.W.

BRITISH METEOROLOGICAL CONFERENCE.

As the British Association meets in Australia this year it has been suggested that it would be desirable to organise a Conference to discuss "The various aspects of the physical sciences in their application to the study of the phenomena of weather." It is proposed upon the invitation of the Scottish Meteorological Society, that the Conference should take place in Edinburgh, on Tuesday, 8th September, 1914, and the four following days.

Sir John Murray, K.C.B., F.R.S., at the unanimous request of the Organising Committee, has consented to act as President of the meeting, while the Vice-Presidents are the Lord Provost of Edinburgh (Mr. R. K. Inches), the President of the Royal Society of Edinburgh, the Director of the Meteorological Office, the President of the Royal Meteorological Society, the President of the Scottish Meteorological Society, the Director of the British Rainfall Organization, and the President of the Royal Aeronautical Society. The proceedings will open with a Presidential address at 10 a.m., on Tuesday, September 8th; the mornings will be devoted to the discussion of scientific subjects connected with the study of the atmosphere. There will be demonstrations during the afternoons, and lectures are to be arranged for two evenings, and a reception for another. Saturday will be filled up by excursions to some places of scientific interest.

The scope of the papers to be discussed will, it is hoped, include the physical and observational aspects of Meteorology, Climatology, including Medico-Climatology, Oceanography, Lymnology, Atmospheric Electricity, Terrestrial Magnetism and Seismology.

The subscription for members of the Conference has been fixed at ten shillings; tickets of admission for ladies accompanying members are to be issued at five shillings. Those interested in the proposal who may wish to become members, are requested to communicate as soon as possible with the Hon. Secretary of the Committee, Mr. F. J. W. Whipple, M.A., at the Meteorological Office, South Kensington, London, S.W.

SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of the Society was held in the Goold Hall, Edinburgh, on the evening of Monday, 23rd February, 1914, when Mr. Gilbert Thomson, M.Inst.C.E., F.R.S.E., Vice-President, delivered a popular lecture on "Mountain Meteorology."

Professor R. A. Sampson, F.R.S., presided over a large attendance, and made sympathetic reference to the great loss the Society had sustained through the recent death of Dr. R. T. Omond, who had done so much for meteorology and especially for that branch of the Science which was to be considered that evening.

Mr. Thomson in his lecture first of all considered the elementary problem of the origin and progress of winds over a smooth globe,

assuming the distribution of land and water to be known, and then pointed out that when these winds encountered mountain ranges and so had to ascend, questions of great complexity were introduced. The expansion of air as it rose to the higher regions, its cooling as the result of this expansion, and its consequent diminished capacity for water vapour, were at the root of all mountain meteorology. The result was to produce mist and rain even from air which at a lower level was comparatively dry; whilst the Föhn wind of the Alps, which had been noticed sometimes in Scotland, had its origin in the converse condition of air descending and becoming heated by compression. Valley fogs and "temperature inversions" might be traced to the same causes under different conditions. The influence of orographical conditions on the distribution of rainfall was discussed, and it was pointed out that in Scotland even the large rivers flowing eastward owed much of their volume to their headwaters among the western mountains. Among secondary phenomena the glaciers of the Alps were referred to as stores of water and of power, whilst even in Scotland the mountain snowfields had a regulating effect on the rivers. The effect of the sun's rays at high altitudes, the increased evaporation due to diminished pressure, and the height at which rainfall ceased to increase, were discussed, and finally reference was made to the work of high level observatories, with special reference to Ben Nevis.

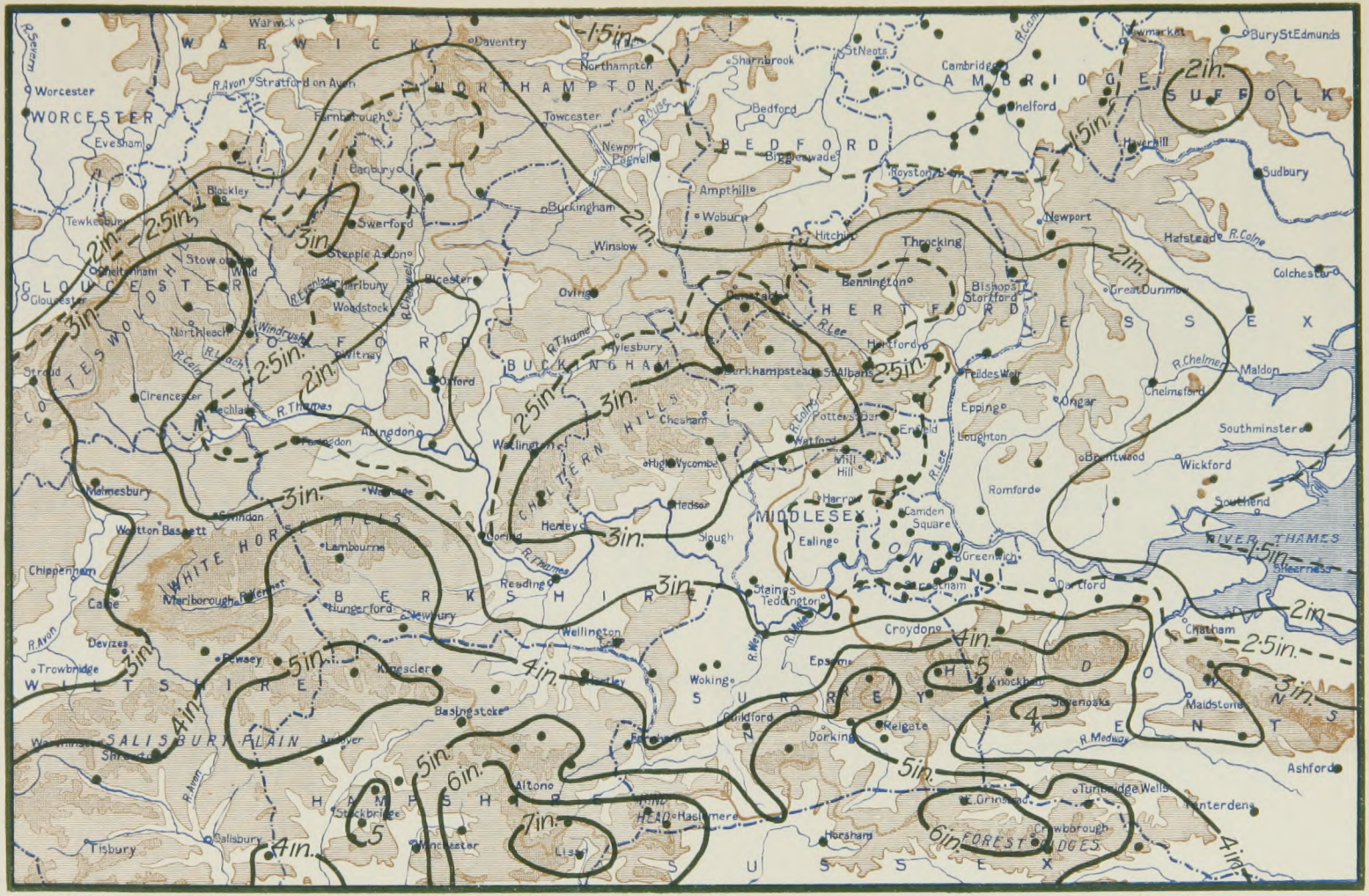
The more technical parts of the lecture were illustrated with useful diagrams, and numerous photographs were shown, many of them from the lecturer's own camera, of weather effects in the Scottish mountains and in the Alps.

The lecture was greatly appreciated, and Mr. Thomson spoke, not only as a student of meteorology, but as an expert mountaineer. A hearty vote of thanks was accorded on the motion of Mr. A. Watt, the Society's Secretary.

THE WEATHER OF FEBRUARY.

THE outstanding feature of the weather of the month was its exceptional mildness, due to the continued prevalence of strong southerly to westerly winds, frequently reaching gale force. From the values given in the *Weekly Weather Report* of the Meteorological Office it was found that the mean temperature of the month, taking the British Islands as a whole, was 4°·0 above the average, the greatest excess being 5°·6 in the east of England, 5°·2 in the north-east of England, and 5°·1 in the Midlands. On the other hand, the departure from the normal did not exceed 2°·6 in Ireland, and in the Channel Islands was only 2°·4. At Camden Square the mean temperature was 44°·5, or 4° 8 above the 56 years' average, the month being the mildest February since 1903, when the mean temperature was 45°·1. The only warmer Februaries back to 1858

THAMES VALLEY RAINFALL — FEBRUARY, 1914.



Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir

Rainfall Stations reporting

Isohyetals.

were 1903, 1872, 1869 and 1867, the mildest of all being 1869, when the mean was 5°·9 above the normal. The warmth last month was somewhat unequally partitioned between the day and night, the mean of the maximum readings being 5°·6 above the normal, while the minimum values were 3°·8 above the normal. During practically the whole month anticyclonic conditions were absent, our islands being under the influence of a constant succession of cyclonic systems passing in a general north-easterly direction to the west of Ireland, and with their centres on the average located over the south of Iceland, but occasionally passing directly over the United Kingdom. The barometric pressure for February, from the average of the 7 a.m. and 6 p.m. readings, showed that the mean value for the month was 29·32 in. at Isafjord in the N.W. of Iceland and was lower further south, falling to 29·15 in. at Reykjavik and 29·10 in. at the Vestmann Islands. At Thorshavn in the Faröe Islands pressure had increased to 29·16 in., and at Horta in the Azores the mercury on the mean of the month was as high as 30·12 in., there being thus a difference of more than an inch of mercury between the latitudes of 63° and 38° N. To the far north pressure again increased, being 29·60 in. at Spitzbergen. The most notable cyclonic system of the month was that of the 22nd when barometric pressure at Dublin fell to the low level of 28·05 in., the lowest observed there since December 8th, 1886.

During the first half of the month temperature was exceptionally high, being over 7° in excess of the normal over the north-east and east of England and the Midland counties, and 5°·6 over the United Kingdom as a whole. Frost was virtually absent, and in the Channel Islands temperature did not fall below 40°.

The month opened with strong southerly winds of gale force, high temperatures, and heavy rain in the north and west. On the 1st, Fort William had 2·69 in. of rain and Bendamph 2·36 in. On the 2nd, some high shade maximum temperatures were noted, the thermometer rising to 60° at Hawarden Bridge, while even in the north of Scotland, Gordon Castle recorded 58° and Nairn 57°. On the 3rd, at Shrewsbury a maximum of 61° was noted, Rhyl reporting a reading of 59°. The lowest readings observed during the first half of the month were 28° at Balmoral on the 3rd, and a similar value at Llangammarch Wells on the 9th. From the 10th to the 14th thunder and lightning, or lightning only, occurred in many localities, and on each day during this period heavy rains were frequent. On the 10th, Treherbert reported 2·07 in., on the 12th, Blaenau-Hydfer had 1·87 in., the maximum fall on the 13th occurred in the uplands of South Wales, Llyn Fawr 2·88 in., Treherbert 2·43 in., and Blaenau-Hydfer 2·00 in., the latter station on the 14th reporting 2·32 in. In the three days from the 12th to the 14th there fell 6·47 in. at Llyn Fawr and 6·19 in. at Blaenau-Hydfer. At London on the 14th the shade temperature rose to 58° or 59°, and on the 15th to 59° at Lowestoft and Yarmouth.

During the second half of the month, speaking broadly, the general distribution of pressure did not differ materially from that observed in the first half, temperature, however, although considerably in excess of the normal was, at times, rather low in Scotland. On the 19th and 20th the shade thermometer fell to 19° at Balmoral, and on the former date to 23° at Fort Augustus.

On the 21st, thunder was heard at Macclesfield and Waterford, and thunderstorms occurred at Holyhead and Roche's Point. On the 22nd, a large and unusually deep cyclonic disturbance advanced from the Atlantic, which caused gales from various quarters in most places, its arrival was preceded on the 20th and 21st by gales from the south, and south-east on many parts of our coasts.

On the 25th the temperature at West Linton fell to 22°, and at Newton Rigg to 24°, a reading of 22° being again recorded at the former station on the 26th. During the second half of the month there were few heavy daily rainfalls recorded. At Seathwaite 2·23 in. fell on the 17th, and 2·11 in. on the 22nd. No other station reported a fall of 2 inches in the 24 hours, but on the 17th Foffany Reservoir had 1·80 in., Dungeon Ghyll on the 20th, 1·67 in., and Dunmanway on the 21st, 1·61 in. The month closed as it began with high temperatures, the shade maximum on the 28th rising to 58° at Rhyl, and to 56° at Nairn and Leith.

The general rainfall of the month expressed as a percentage of the average was: England and Wales, 136; Scotland, 145; Ireland, 202; British Isles, 157.

REVIEWS.

The Ocean, by Sir John Murray, K.C.B., F.R.S. London: Williams and Norgate. Size 7 × 4, pp. 256 and plates. Price 1s.

This fascinating book by the leading authority on the science of the sea, is a recent addition to the Science Series of the Home University Library, and one which we can cordially commend to our readers. In it we have in a necessarily highly condensed but admirably balanced form a lucid account of oceanography, largely derived from the practical experience of one whose whole life has been associated with the development and practical application of this science to the varied interests of humanity. The work opens with a few historical statements, followed by a description of instrumental and other methods involved in deep sea research. Chapter II. deals with the depth of the ocean, and it is shown that by far the greatest areas are covered by water of from 2000 to 3000 fathoms, the whole Atlantic Ocean having 48 per cent. of water of this depth, the Indian Ocean 59 per cent, and the Pacific Ocean 65 per cent., while the whole ocean averages 58 per cent. The greatest proportion of shallow water (less than 1000 fathoms) is found in the Atlantic, while the Pacific and Indian Oceans have 10 and 11 per cent.

respectively. The volume of dry land above sea level is shown to be 23,000,000 of cubic miles, while the volume of the waters of the ocean is estimated at 324,000,000 of cubic miles. In subsequent chapters Sir John deals with the salinity, gases, temperature, tides and waves of the ocean, its circulation, plant and animal life. The concluding pages summarise the leading features referring to the floor of the ocean, and the results of the analysis of thousands of samples of deep sea and shallow water deposits. The final chapter is devoted to the geospheres, the globe being regarded as made up of six concentric spheres, the atmosphere, hydrosphere, biosphere, lithosphere, tektosphere, and the centrosphere. A glossary of technical words and expressions is given, and an excellent feature is the series of twelve plates appended, although here one misses a map showing the mean surface temperature of the ocean. The book, while primarily adapted to the needs of the lay reader, is one which will repay perusal by meteorologists, physicists and biologists who wish to make themselves familiar with the rapid advance in the new science of oceanography initiated by the great expedition of the *Challenger* forty years ago.

Rainfall Reservoirs and Water Supply, by Sir A. R. Binnie. London: Constable and Company, Ltd. 1913. Size 9 × 6. Pp. xi.+157. Price 8s. 6d. nett.

Sir Alexander Binnie in this interesting and welcome volume illustrates some of the salient points associated with the practical application of rainfall observations to the affairs of daily life, showing how meteorological, geological and chemical data are essential to the sanitary Engineer. As the author points out in the preface the work is not a complete treatise on Waterworks Engineering, but an attempt to elucidate some of the utilitarian aspects of one of the most difficult points met with by the Engineer.

The first chapter deals with the measurement of rainfall, the effect of the geographical position of a station with reference to the nature and direction of prevailing winds is discussed, and it is shown that the lee side of a mountainous region frequently experiences the maximum rainfall, and diagrams are also given to illustrate how the precipitation increases as the land rises. The question of the proportion of rain that may fall in the wettest and driest years, the three wettest and driest years, and in other periods of years above or below the normal is shown by means of tables and diagrams. Other chapters deal with the flow from the ground, including flood intensity and evaporation, water supply *per capita*, qualities of water, hardness —impurities—filtration. Chapter IV. deals with the sources of supply, drainage areas, and deductions for stream compensation. Fully two-thirds of the work deals with purely engineering aspects such as the construction of reservoirs, dams, culverts, tunnel outlets and aqueducts, all treated in detail in a most interesting manner and copiously illustrated.

Ingatestone and the Essex Great Road, by E. E. WILDE. H. Milford, London, 1913. Size 9 × 6. Pp. 488, 5 maps and 1 plate.

WE do not, as a rule, open our review pages to books of a non-meteorological character, unless, as it sometimes happens, accounts of atmospheric phenomena, made peculiarly valuable from the evidence of eye-witnesses, find a place in them which they do not find elsewhere. We have read Mrs. Wilde's scholarly book with exceptional interest, especially the account of the notable hailstorm and squall which swept over Ingatestone on June 24th, 1897, described on pages 341-344. This supplements the account which appeared in this Magazine (Vol. **32**, 1897, p. 81). A map showing the course of the storm, specially drawn by Mr. D. S. Salter, of the British Rainfall Organization, adds greatly to the utility of Mrs. Wilde's history of the phenomenon. The book also contains a brief note on the rainfall of the district, which is one of the driest in the British Isles. C.S.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

April 6th, 1911.

Starting Point.	Country.	A (H_c) miles.	B (T_c) ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill*	England ..	6·2	—63	8·7	—64	75	S.W. byW
Pyrton Hill.....	England ..	6·1	—58	9·4	—59	60	W.S.W.
Brussels	Belgium ..	5·3	—63	9·4?	?	71	W.
Hamburg	Germany..	6·4	—64	12·6	—59	36	W.S.W.
Lindenbreg	„ ..	5·6	—67	9·5	—62	4	W. by N.
Paris	France ...	4·9	—50	10·7	—63	50	W. by S.
Strassburg.....	Germany..	5·3	—63	9·2	—49	33	W. by N.
Munich	„ ..	5·4	—67	6·7	—53	21	N.W.
Vienna.....	Austria ..	5·6	—62	6·6	—54	20	N.N.W.
Pavia	Italy	5·8	—59	10·4	—50	28	N.N.E.
Pavlovsk	Russia	5·6	—68	9·7	—64	58	E.
Nishni Olchedaeff	„ ..	6·3	—75	9·1	—53	23	N.E.

* 6 p.m., April 5th.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

The value of H_c was low throughout, and, with the exception of Paris, very uniform. The surface temperature in the S.E. of England was exceptionally low for the date, and a temperature of — 20° F. at a height of 10,000 ft. over Pyrton Hill, on April 5th, is the lowest yet recorded at that height in England.

An anticyclone lay over the north of Scandinavia extending westwards towards Iceland, and there were various depressions over the Mediterranean.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

BISHOP'S RING.

While at Kandersteg, Canton Berne, recently this interesting appearance was twice clearly seen, namely, on Friday and Monday, January 16th and 19th, in each case from an Alp at 5000 to 5500 ft. elevation, and to less advantage on the 16th from Kandersteg itself, at 4000 ft. It could not be distinguished when the sun was in sight, but directly that was behind a peak the orange-tawny ring round a markedly greenish circle of 15° to 20° radius became sufficiently marked for others of the party to be interested when their attention was called to it. The ring itself stretched over another 15° or so, as roughly measured by the eye.

As yet I have not been able to make, nor have I heard of, an observation of it in England, but its re-appearance, following the striking series of Krakatoa-like sunsets last year, at intervals from early June to mid-December (I have 59 sunrise and sunset records in all), is significant, as pointing to an association of both phenomena with the Aleutian eruption in May, 1912.

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey, February 4th, 1914.

WEATHER AT PEMBA, ZANZIBAR.

The following summary of Meteorological observations taken at this station during the year 1913, and also for the past fifteen years, may be of interest.

	For the year 1913.	For the past 15 years.
Mean maximum temperature	81·4	81·9
Mean minimum temperature	69·8	70·5
Absolute maximum temperature	90·0	95·0
Absolute minimum temperature	65·0	62·0
Extreme range	25·0	33·0
Rainfall in inches	86·89	82·96
Rainy days	177·0	156·5

Sun temperature in January reaches 175·0.
Sun temperature in July reaches 150·0 only.

THEODORE BURTT.

Friends' Industrial Mission, Banani, Pemba, Zanzibar, 10th January, 1914.

GLAZED FROST.

THE question whether raindrops were super-cooled upon any special occasion could easily be settled by allowing the drops to fall upon a surface kept exactly at the freezing point. If the drops were super-cooled ice would appear when they struck, if not, since the water would be in close contact with a surface not below the freezing point no ice would form. Such a surface could be obtained by using a thin metal vessel filled with a mixture of broken ice and water. It would have to be kept well shaken, and not much handled so that the water inside and the metal might be exactly at 32° F. It is true that a slight rise of temperature would occur as the drop struck, just as a bullet gets hot on striking a target, but as the falling velocity is small this could hardly amount to ·01°.

W. H. DINES.

A LOCAL COLD AREA.

A VERY striking example of the remarkable differences of temperature which are sometimes observed during foggy weather in the Metropolitan, or similarly more or less restricted areas, occurred here on February 27th

As in most other parts of London, the early morning was very foggy, the minimum shade temperature during the preceding night having been 27°, whilst the 9 a.m. reading was 31°. In contradistinction to other districts the fog did not clear off between 11 a.m. and noon but remained very thick until 1 p.m., after which it cleared considerably, but the air remained very misty and the sunshine extremely feeble. At noon the temperature was still only 32° and at 1.30 p.m., 35°. During the afternoon there was a recovery to the maximum of 39·2°, which occurred at 4 p.m., after which it again fell to 36° at 6 p.m. (as against 47° to 51° at the other London recording stations), to 30° at 10 p.m., and to a minimum of 24° during the ensuing night, when the reading on the grass was as low as 18°.

In other parts of the Metropolis the fog appears to have cleared off at the latest at about 11.30 a.m., after which the weather was brilliantly sunny and very mild. In many parts of London from four to nine hours of bright sunshine were registered and the maximum temperature was apparently in all cases over 50°, that registered in St. James' Park being as high as 55°, or 16° higher than that recorded here.

You may think this remarkable record of sufficient importance for inclusion in your columns, being specially notable in view of the lateness of the season and the consequent increasing power of the sun to disperse fog.

I may add that there was practically no wind during the whole of the day, with the exception of occasional light airs from the south and also north-east.

HAROLD FREIR.

Bylock Hall, Ponders End, N., 2nd March, 1914.

THE STEVENSON SCREEN.

I AM very glad to see from Mr. Butler's letter in your Magazine for February, that the Stevenson Screens in the south now have double tops and closed bottoms, as it is now nearly 30 years since I pointed out (*Pro. Roy. Soc. Edin.*) the necessity for these protections. At that time I was told that such additions to the screen were objectionable as the readings given by them could not very well be compared with the previous results. But while these additions have been adopted by the makers of the screens in the south, this is not the case with the makers of the screen for the Scottish Meteorological Society from whom I have received a number of screens, the last one only two or three years ago, all the screens were exactly alike but not one of them had either double top or any protection at bottom.

The want of uniformity in the temperature of the air during sunshine, referred to by Mr. Ellison in your last number, is well known. In one of the papers previously referred to there is described a thermometer with a long fine cylindrical bulb only 1·5 mm. diameter. When this thermometer is put under a sunshade while the sun shines the unequal heating of the "shreds and patches" of the passing air is shown by the constant up and down movement of the mercury. It is kept in a constant state of pulsation, moving up and down a degree in less than a minute, and of course the differences shown are not the whole differences in the different shreds of air. But while the air is a mixture of shreds and patches at different temperatures, I fear Mr. Ellison will get few to agree with him in thinking that because we cannot get perfection there is no use of attempting to get a nearness to it. All our measurements of the velocity of rivers, winds and many other things are of the same nature, and yet we go on trying to get as near the truth as possible.

Though the whole mass of air is a mixture of more or less heated patches, yet there is a true temperature to be attained by mixing the lot, and a thermometer when placed in a screen does this fairly well. The very fine bulbed thermometer shows the inequalities in the temperatures of the different patches, while the screen helps to mix the different airs, and to cool the hot parts and warm the cold ones as they pass over the louvres; while the larger bulbed thermometers give a fair mean of the mixture. But the screen must always read higher than the true temperature of the air while the sun shines, especially if the wind is light and from the heated side of the screen, as the sun-heated louvres heat the air entering the screen. Its readings in sunshine are, therefore, always higher than those given by a thermometer placed in a properly protected enclosure through which a current of air is artificially kept flowing. I may also say that the screen gives higher readings than the very fine bulbed thermometer placed in the open, but under a sunshade. This is especially the case when the bulb is coated with polished silver, and it then gives readings similar to thermometer in artificial current of air.

Both of your correspondents object to the use of the artificial air current for getting the true temperature of the air, but neither give reasons for objecting, or suggest any other standard with which to compare the screens. It was used in the tests referred to because it was considered to be the most accurate method of getting the true temperature of the air, and was, and so far as I know still is, used for this purpose on the continent. JOHN AITKEN.

Ardenlea, Falkirk, 23rd February, 1914.

A PLEA FOR A WORLD'S BUREAU OF METEOROLOGY.

LATE frosts, or wide-spread droughts, in Eurasia, North America, South America or Australia, may mean the loss of millions of pounds in the value of the world's food products,* and this is the prime factor in determining human welfare in every activity of life.

Variations of rainfall precede to some extent the variations in crop production, and these in turn precede the variations in business activity and in the values of securities.

The closeness of these relations have been known to the shrewdest business men for years, and agents are now maintained in all the crop bearing parts of the world to report to private interests the occurrence of late or early frosts, of droughts and all other conditions which may influence crops. Even the information thus furnished is inadequate, and falls far below what might be obtained by an organized bureau.

There is at Rome a World Bureau for Agriculture. There should, in like manner, be a Bureau for World Meteorology. The object of such a bureau would be to gather by telegraph or cable information from all the national bureaus of the world, and from the oceans so far as possible. Chart and correlate the assembled data, and furnish such information to the national bureaus as would be of service to each. With such a World Weather Bureau organized it would not be many years before seasonal forecasts could be begun, and, with such a service in successful operation, the interests of the world would be advanced in a way hardly yet conceived of. There is scarcely a phase of human activity not affected in some way by the weather. The clothier lays in overcoats, furs, fans, etc., to meet the conditions of the ordinary season. The coal dealer, the ice dealer, the shoe dealer, the dealer in rubber goods, etc., do the same thing, and if there is a marked variation from the ordinary season there are heavy losses either to the dealer or to the community, and the total waste of human effort is enormous. H. HELM CLAYTON.

Oficina Meteorológica Argentina, Buenos Aires, January 30th, 1914.

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* A severe drought may cause a loss of $100,000,000 in the United States alone.

ORIGIN OF THE SNOWDON GAUGE.

My attention has been called to letters in recent numbers of your Magazine on the origin of the Snowdon Rain Gauge. The chief feature of the Snowdon gauge is that it possesses a deep rim which avoids splashing of the rain over the edge of the funnel.

The suggestion and use of such a rim, and therefore the origin of the Snowdon gauge, dates back far beyond the years mentioned by either Colonel Ward, Mr. Gilbert, or Mr. Scott. I believe the earliest recorded gauge of this type was that of the celebrated Dr. John Dalton, F.R.S., who, writing from Kendal in 1788, in a letter to one of his Eaglesfield pupils with a request that a gauge should be kept at Eaglesfield gives full direction for the construction of the gauge, mentioning that "the funnel may be 6, 7, or more inches over, and *if it have an upright rim of an inch it is better*, but will do without it." A few years later, however, he decided *it would not do without it*, and certainly during several years before the year 1831 (eighty-three years ago) Dr. Dalton used a gauge having a funnel 10 inches in diameter *with a 5 inch upright rim.* The gauge is described in detail by my father (the late Mr. Henry Hough Watson, F.C.S., who was a pupil of Dr. Dalton) in *Symons's British Rainfall of 1869*, and his observations of rainfall and evaporation with this gauge for the ten years from 1831 to 1840, at Bolton, were published by Dr. Dalton in the *Manchester Philosophical Society's Memoirs* at that time, Vol. **6.** My father continued to use this form of gauge until the year of his death, 1886, and since then I have continued to use one of exactly the same pattern.

Dr. Dalton would appear to have been the originator of the idea of the deep rim and therefore of the modern or "Snowdon Gauge," in which there has been no practical change.

WILLIAM HENRY WATSON, F.G.S., F.C.S.

Braystones House, Cumberland, February 23rd, 1914.

LARGE SNOWFLAKES.

On Saturday, the 21st February, about 10.40 a.m. or so, a shower of rain and hail came up from the south-west: rather later in the morning the rain turned to snow which lasted for nearly an hour. Some of the snowflakes were of enormous size and must have measured three inches: they looked as if they would fit into the mouth of an ordinary sized tea cup. The size was so remarkable that everybody noticed it. Unfortunately in some ways, they melted too quickly for any measurement to be taken, but one made a guess at it by observing their size with relation to leaves, &c., on which they fell.

E. ASTON.

Stonehurst, Five Ashes, Tunbridge Wells, February 26th.

DETONATING FIREBALL ON JANUARY 19th.

THE "peal of distant thunder" heard by Colonel Chrystie about five minutes later than, and in the same direction as, the brilliant meteor he saw on January 19th, was undoubtedly connected with that object. I have received about twenty descriptions of the meteor from the counties of Berks, Oxon, Hants, and Surrey, and they nearly all refer to the loud detonation which followed its brilliant outburst of light. A large number of accounts have also been published in the newspapers.

The sky was not at all favourable. At many places only a few stars could be discerned, at others the firmament was quite veiled, but the astonishingly intense lustre of the meteor broke through the obscurity and just for a moment or two made the country almost as light as day.

The prevailing conditions rendered exact observations of the meteor's path impossible. From careful comparisons of the positions given I conclude that the path of the object was from a point N.W. of Luton, Beds, to Brightwaltham, Berks, and during its flight of about 67 miles it descended from a height of 51 to 11 miles, at a velocity of 14 miles per second. The radiant point was probably at 130° + 47°, which is just S. of the forepaws of the "Great Bear."

If the final disruption and loud explosion occurred over Brightwaltham, as many of the observations suggest, then Colonel Chrystie, at Farnham, was about 36 miles distant from it. Sound, in ordinary air, would traverse this in about three minutes, but in the rarified regions of our atmosphere sound is a slower traveller, and the meteor's height may possibly have been somewhat greater than that assigned. It was certainly, however, near the earth at the instant of its disintegration, and I should not have been surprised to hear that some of the fragments had been seen falling to the ground. Many meteoric stones alighting in thinly populated districts must, however, escape record.

W. F. DENNING.

Bristol, February 18th, 1914.

THE CLIMATE OF TORQUAY.

APROPOS of the recent discussion on the climate of Torquay I write to say that, having had occasion to visit relatives at Paignton recently, I made a careful study of the topography of the district, with the result that I can confirm Mr. Macdowall's contention that there is, and must be, a great diversity in the local climatic conditions. The high ground at the back of the town is fully exposed to every wind that blows—to the rough gales from the sea as well as to the cold land winds blowing down from Dartmoor. The bottom of the town, on the other hand, sheltered from northerly and westerly winds and getting the full benefit of any sunshine that

is "going," has locally an almost southern character, and permits a species of *viola* in the Rock Gardens to bloom fairly freely in the depth of winter. Likewise the higher lying hollow containing Kent's Cavern is so favourably situated with respect both to the sun and to shelter from wind that garden produce is relatively forward therein. The higher parts of Torquay are liable to experience very bleak westerly winds when, as is not seldom, snow in any quantity is lying on Dartmoor. In this connection it was remarked to me during a visit to Exeter, on December 30th, that the presence of much snow on Dartmoor was keeping the weather unusually bitter in the city, although there was not much snow lying in the streets or in the Exe valley.

The abundance of myrtles, fuschias, yuccas, etc., in Torquay gardens often gives rise to exaggerated notions as to the freedom from frost of the south coast of Devon. The correct interpretation of the facts is otherwise, that these exotics *can* stand occasional severe frost. Although this coast is much sunnier, and has a mean winter temperature some 3 degrees higher than the neighbourhood of London, the general climate of England is much the same everywhere, and a spell of hard weather over the country generally is apt to be no respecter of places, as invalids often find to their cost.

L. C. W. BONACINA.

Hampstead, N. W., February 3rd, 1914.

THE WINTER SEASON.

IT may be worth noting that these last two winters at Greenwich (ending in 1913 and 1914) conform to past experience, since 1841, in this respect: The winters of years ending in 3 and 4 (*i.e. ending* in those years) have all been mild except one (1854), which had but a small excess of frost days in September to May (+4).

A "rule of thumb," being merely empirical, and "suggested by practical rather than scientific knowledge" (as a Dictionary says) may inspire no great confidence. Yet it may have its uses.

A.B.M.

CLIMATOLOGY IN RELATION TO AGRICULTURE forms the subject of a course of Lectures now being given by Mr. W. E. Whitehouse, F.R.Met.Soc, of the University College of Wales, Aberystwyth. During his tenure of the Gilchrist Studentship in Geography, Mr. Whitehouse worked specially at Climatology both at the Meteorological Office and at the Office of the British Rainfall Organization. He gave last term a course of lectures on Climatology in relation to Geography.

It is satisfactory to know that Dr. Shaw's repeated appeals for the encouragement of the further study of Meteorology at the Universities is being responded to, as in the present instance.

RAINFALL TABLE FOR FEBRUARY, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	RAINFALL OF MONTH. 1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·66	2·37
Tenterden	*Kent*	51 4	*0 41	190	1·90	3·74
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·17	4·16
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·28	4·26
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·62	1·65
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·69	1·18
Shoeburyness	*Essex*	51 31	*0 48	13	1·19	1·09
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·59	1·93
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·41	1·39
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·95	5·08
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·50	3·86
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·12	2·92
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·17	2·83
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·01	1·46
Boston	*Lincolnshire*	52 58	0 1	11	1·53	·83
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·64	·96
Macclesfield	*Cheshire*	53 15	2 7	501	2·30	2·15
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	2·07	2·01
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·88	6·94
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·71	1·53
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·78	·75
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·63	1·20
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	10·96	21·14
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·07	3·81
Haverfordwest	*Pembroke*	51 48	4 58	90	3·42	5·21
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·09	4·86
Llandudno	*Carnarvon*	53 20	3 50	72	2·11	2·62
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·42	7·45
Marchmont House	*Berwick*	55 44	2 24	498	2·15	2·00
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·87	7·01
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·70	3·73
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	5·71	8·94
Mull (Quinish)	,,	56 34	6 13	35	4·45	7·83
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·91	2·43
Braemar	*Aberdeen*	57 0	3 24	1114	2·55	4·22
Aberdeen (Cranford)	,,	57 8	2 7	120	2·36	2·45
Cawdor	*Nairn*	57 31	3 57	250	2·06	1·16
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·20	4·12
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·53	13·03
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·58	2·10
Wick	*Caithness*	58 26	3 6	77	2·23	2·60
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·99	10·81
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·18	5·47
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·89	6·57
Ennistymon House	*Clare*	52 57	9 18	37	3·44	8·23
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·75	5·24
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·55	4·73
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·93	2·48
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·67	4·81
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·20	9·00
Cong (The Glebe)	,,	53 33	9 16	112	3·72	9·21
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·20	6·84
Seaforde	*Down*	54 19	5 50	180	2·81	3·90
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·56	5·13
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·68	5·43

Erratum.—Nenagh (Castle Lough)..... For January *read*... 3·88 2·86

RAINFALL TABLE FOR FEBRUARY, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·71	143	·47	21	14	3·49	2·92	— ·57	84	25·11	Camden Square
+1·84	197	·95	21	20	4·04	4·45	+ ·41	110	27·64	Tenterden
+1·99	192	·60	17	16	4·76	4·72	— ·04	99	30·48	Patching
+1·98	187	·60	21	22	5·03	4·94	— ·09	98	31·87	Cadland
+ ·03	102	·32	21	16	3·40	2·14	—1·26	63	24·58	Oxford
— ·51	70	·27	17	16	3·58	2·02	—1·56	56	25·17	Croyland Abbey
— ·10	92	·42	21	16	2·52	1·72	— ·80	68	19·28	Shoeburyness
+ ·34	121	·44	11	13	3·29	3·90	+ ·61	119	25·40	Westley
— ·02	99	·51	21	14	2·94	3·16	+ ·22	107	23·73	Geldeston
+2·13	172	·90	12	20	6·54	6·75	+ ·21	103	38·27	Polapit Tamar
+1·36	154	·60	7	19	5·44	4·70	— ·74	86	33·54	Rousdon
+ ·80	138	·51	21	17	4·45	3·68	— ·77	83	29·81	Stroud
+ ·66	130	·57	12	17	4·68	3·84	— ·84	82	32·41	Wolstaston
— ·55	73	·19	13	13	4·23	2·34	—1·89	55	28·98	Coventry
— ·70	54	·13	17	17	3·07	2·46	— ·61	80	23·35	Boston
— ·68	59	·37	21	14	3·34	1·94	—1·40	58	24·46	Hodsock Priory
— ·15	93	·45	21	13	4·96	4·51	— ·45	91	34·73	Macclesfield
— ·06	97	·28	17†	15	4·62	3·58	—1·04	77	32·70	Southport
+2·06	142	1·04	14	23	11·14	12·62	+1·48	113	61·49	Arncliffe
— ·18	89	·40	22	10	3·60	2·64	— ·96	73	26·87	Ribston Hall
—1·03	42	·25	21	14	3·48	2·60	— ·88	75	26·42	Hull
— ·43	74	·42	21	19	3·53	3·33	— ·20	94	27·94	Newcastle
+10·18	193	2·23	17	25	24·40	33·27	+8·87	136	129·48	Seathwaite
+ ·74	124	·80	13	23	6·72	5·92	— ·80	88	42·28	Cardiff
+1·79	152	·65	12, 17	21	8·11	7·44	— ·67	92	46·81	Haverfordwest
+1·77	157	·84	12	23	7·00	8·56	+1·56	122	45·46	Gogerddan
+ ·51	124	·47	22	18	4·62	4·71	+ ·09	102	30·36	Llandudno
+4·03	218	·92	17	27	7·52	11·36	+3·84	151	43·47	Cargen
— ·15	93	·38	15	16	4·55	3·96	— ·59	87	33·76	Marchmont
+3·14	181	1·02	18	26	8·65	10·77	+2·12	125	49·77	Girvan
+1·03	138	·45	17	26	6·23	6·93	+ ·70	111	35·97	Glasgow
+3·23	156	·93	5	28	13·05	16·50	+3·45	126	68·67	Inveraray
+3·38	176	·92	7	28	10·00	12·52	+2·52	125	56·57	Quinish
+ ·52	127	·49	22	18	3·92	3·88	— ·04	99	28·64	Dundee
+1·67	165	·70	22	21	5·47	7·10	+1·63	130	34·93	Braemar
+ ·09	104	·57	20	15	4·72	3·96	— ·76	84	32·73	Aberdeen
— ·90	56	·38	5	8	4·34	3·69	— ·65	85	29·33	Cawdor
— ·08	98	·74	5	22	9·78	8·10	—1·68	83	44·53	Fort Augustus
+5·50	173	2·36	1	26	16.95	23·14	+6·19	136	83·93	Bendamph
— ·48	81	·46	20	14	5·33	5·45	+ ·12	102	31·90	Dunrobin Castle
+ ·37	117	·57	20	18	4·71	4·50	— ·21	96	29·88	Wick
+5·82	217	1·22	10	28	10·93	15·99	+5·06	146	54·81	Killarney
+2·29	172	1·10	21	24	6·96	7·55	+ ·59	108	39·57	Waterford
+3·68	227	·96	7	26	6·77	9·43	+2·66	139	39·43	Castle Lough
+4·79	239	·70	17	27	7·74	11·34	+3·60	147	46·52	Ennistymon
+2·49	191	·67	10	25	5·94	6·33	+ ·39	107	34·99	Courtown Ho.
+2·18	186	·80	21	25	5·70	6·28	+ ·58	110	35·92	Abbey Leix
+ ·55	129	·46	21	19	4·07	3·48	— ·59	85	27·68	Dublin
+2·14	180	·72	20	27	5·77	6·37	+ ·60	110	36·15	Mullingar
+4·80	214	1·19	17	28	9·55	12·25	+2·70	128	52·87	Enniscoe
+5·49	248	1·17	5	26	8·51	13·05	+4·54	153	48·90	Cong
+3·64	214	·75	12	27	7·07	9·09	+2·02	129	42·71	Markree
+1·09	139	·71	10	24	6·22	5·48	— ·74	88	38·91	Seaforde
+2·57	201	·76	7	25	5·75	7·02	+1·27	122	37·56	Dundarave
+2·75	202	·62	7	28	6·14	7·95	+1·81	130	39·38	Omagh
—1·02	74	·96	10	16	...	...	...	...		

† And 20, 22.

SUPPLEMENTARY RAINFALL, FEBRUARY, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	5·27	XI.	Lligwy	4·19
,,	Ramsgate	1·47	,,	Douglas	4·24
,,	Hailsham	4·53	XII.	Stoneykirk, Ardwell House...	4·05
,,	Totland Bay, Aston House...	3·84	,,	Dalry, The Old Garroch.....	8·68
,,	Stockbridge, Ashley..	5·00	,,	Beattock, Kinnelhead	10·30
,,	Grayshott	6·41	,,	Langholm, Drove Road	6·41
III.	Harrow Weald, Hill House...	2·57	XIII.	Meggat Water, Cramilt Lodge	7·03
,,	Caversham, Rectory Road ...	2·57	,,	North Berwick Reservoir.....	1·19
,,	Pitsford, Sedgebrook.....	1·40	,,	Edinburgh, Royal Observaty.	1·74
,,	Woburn, Milton Bryant.....	1·79	XIV.	Maybole, Knockdon Farm ...	4·42
,,	Chatteris, The Priory.....	·97	XV.	Ballachulish House	11·47
IV.	Elsenham, Gaunts End	2·24	,,	Campbeltown, Witchburn ..	7·42
,,	Colchester, Hill Ho., Lexden	1·85	,,	Holy Loch, Ardnadam.....	10·91
,,	Ipswich, Rookwood, Copdock	1·82	,,	Islay, Eallabus	7·37
,,	Blakeney.....	·92	,,	Tiree, Cornaigmore	6·01
,,	Swaffham	1·32	XVI.	Dollar Academy	4·14
V.	Bishops Cannings	2·93	,,	Balquhidder, Stronvar.....	9·00
,,	Wimborne, St. John's Hill ...	5·35	,,	Glenlyon, Meggernie Castle..	10·60
,,	Ashburton, Druid House..	8·67	,,	Blair Atholl	5·48
,,	Cullompton	3·86	,,	Coupar Angus	3·51
,,	Lynmouth, Rock House	5·81	,,	Montrose, Sunnyside Asylum.	2·48
,,	Okehampton, Oaklands.. ...	6·44	XVII.	Alford, Lynturk Manse	2·91
,,	Hartland Abbey.....	4·20	,,	Fyvie Castle	1·92
,,	Probus, Lamellyn.....	4·47	,,	Keith Station	1·63
,,	North Cadbury Rectory.....	3·27	XVIII.	Rothiemurchus	2·00
VI.	Clifton, Pembroke Road.....	3·46	,,	Loch Quoich, Loan	20·85
,,	Ross, The Graig	2·81	,,	Drumnadrochit	3·46
,,	Shifnal, Hatton Grange.....	1·95	,,	Skye, Dunvegan	10·53
,,	Droitwich.....	1·70	,,	Lochmaddy Bayhead	7·67
,,	Blockley, Upton Wold.....	2·42	,,	Glencarron Lodge	7·24
VII.	Market Overton.....	1·57	XIX.	Invershin	1·96
,,	Market Rasen	·74	,,	Melvich	2·52
,,	Bawtry, Hesley Hall	·84	,,	Loch Stack, Ardchullin	6·99
,,	Derby, Midland Railway.....	1·33	XX.	Skibbereen Rectory	7·51
,,	Buxton	2·91	,,	Dunmanway, The Rectory ..	11·03
VIII.	Nantwich, Dorfold Hall	1·51	,,	Glanmire, Lota Lodge, No. 1	6·76
,,	Chatburn, Middlewood	2·62	,,	Mitchelstown Castle.....	7·05
,,	Cartmel, Flookburgh	4·80	,,	Darrynane Abbey.....	11·26
IX.	Langsett Moor, Up. Midhope	3·01	,,	Clonmel, Bruce Villa	6·64
,,	Scarborough, Scalby	1·70	,,	Newmarket-on-Fergus, Fenloe	5·83
,,	Ingleby Greenhow	2·72	XXI.	Laragh, Glendalough	7·30
,,	Mickleton	4·70	,,	Ballycumber, Moorock Lodge	3·61
X.	Bellingham, High Green Manor	4·64	,,	Balbriggan, Ardgillan	2·21
,,	Ilderton, Lilburn Cottage ...	2·53	XXII.	Woodlawn	5·37
,,	Keswick, The Bank.....	9·25	,,	Westport, St. Helens	8·58
XI.	Llanfrechfa Grange	4·97	,,	Dugort, Slievemore Hotel ...	9·94
,,	Treherbert, Tyn-y-waun	13·80	,,	Mohill Rectory	5·41
,,	Carmarthen, The Friary	6·20	XXIII.	Enniskillen, Portora.....	6·02
,,	Castle Malgwyn [Llechryd]...	6·11	,,	Dartrey [Cootehill]	3·94
,,	Crickhowell, Tal-y-maes.....	6·50	,,	Warrenpoint, Manor House ..	3·97
,,	New Radnor, Ednol	4·44	,,	Banbridge, Milltown	2·60
,,	Birmingham WW., Tyrmynydd	8·93	,,	Belfast, Cave Hill Road	3·29
,,	Lake Vyrnwy	5·07	,,	Glenarm Castle..... ...	5 04
,,	Llangyhanfal, Plâs Draw.....	2·50	,,	Londonderry, Creggan Res...	6·62
,,	Dolgelly, Bryntirion.....	5·88	,,	Dunfanaghy, Horn Head ...	7·34
,,	Bettws-y-Coed, Tyn-y-bryn...	6·92	,,	Killybegs	6·53

METEOROLOGICAL NOTES ON FEBRUARY, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Generally fine and bright in the early part, but dull in the latter half. The mild conditions of the last few days of January continued into February, the 18 days from January 29th to February 15th all having shade max. above 50°. The mean temp. of the month, 44°·5, was 4°·8 above the average, and with only 4 exceptions the highest for February in the 57 years' record. Duration of sunshine 56·6* hours, and of R 55·9 hours. Evaporation ·24 in. Shade max. 59°·1 on 14th; min. 29°·4 on 27th. F 2, f 11.

TENTERDEN.—Beautifully fine most of the first week and at end of month. R nearly every day from 6th to 22nd. Duration of sunshine 115† hours. Shade max. 54° on 14th; min. 30° on 27th. F 4, f 14.

TOTLAND BAY.—The warmest February in 28 years' record, and, excepting February, 1900, with a R of 5·07 in., the wettest also in that period. Mean temp. 45°·0. Duration of sunshine 89·1* hours. Shade max. 51°·0 on 13th; min. 35°·1 on 25th. F 0, f 4.

PITSFORD.—A pleasant month, with many bright days. R ·59 in. below the average. Mean temp. 41°·6. Shade max. 57°·5 on 15th; min. 25°·6 on 27th. F 8.

IPSWICH, COPDOCK.—Duration of sunshine 105·3* hours, and the most recorded in February in the past 11 years. Mean temp. 43°·5. Up to 21st a persistent series of disturbances with constant R, after which the weather became more settled, and the month ended brilliantly. Shade max. 57°·4 on 14th, ; min. 29°·8 on 24th. F 5, f 11.

POLAPIT TAMAR.—Unusually mild, wet and stormy. Shade max. 54°·6 on 4th; min. 28°·3 on 17th. F 4, f 7.

NORTH CADBURY.—Continuous and abnormal warmth. Only 5 days with shade max. below 50°. Some beautiful sunny weather near beginning and end, but a long spell of wet and violent storms in between. Shade max. 59°·0 on 14th; min. 30°·5 on 17th. F 2, f 13.

HODSOCK PRIORY.—Warmer than any February in the previous 35 years, except 1903. Pressure was very low, and the winds strong. Shade max. 56°·0 on 14th; min. 30°·3 on 9th. F 5, f 14.

SOUTHPORT.—The warmest February in 43 years' record. Mean temp. 45°·0, or 5°·7 above the average. Duration of sunshine 59·9* hours, and of R 47·1 hours. Evaporation ·40 in. Shade max. 56° on 2nd; min. 26° on 25th. F 2, f 11.

HULL.—Remarkably fine and dry throughout. Duration of sunshine 58·4* hours. Shade max. 56° on 1st; min. 33° on 22nd. F 0, f 9.

HAVERFORDWEST.—First week fine, afterwards mild, stormy and wet. Gales on 8 days. Duration of sunshine 58·6* hours. Shade max. 54°·5 on 13th; min. 32°·0 on 21st. F 1.

BETTWS-Y-COED.—Shade max. 58° on 5th; min. 31° on 25th. F 2, f 3.

CARGEN.—Warmest and wettest February for many years. Shade max. 52°·0 on 5th; min. 27°·5 on 25th. F 2.

MARCHMONT.—Duration of sunshine 52·1 hours.

COUPAR ANGUS.—Persistently wet and remarkably mild. Mean temp. 4°·3 above the average. Shade max. 53° on 1st; min. 26° on 19th.

LOCH STACK.—Duration of sunshine 45·3* hours.

CASTLE LOUGH.—The wettest February since record commenced in 1875.

DUBLIN.—An unsettled, mild, showery, and squally month of S. and S.W. winds, which attained gale force on 8th, 11th and 22nd. Mean temp. 46°·0. Bar. reading between 9 and 10 a.m. on 22nd, 28·047 in., was the lowest since 8th December, 1886. Shade max. 58°·0 on 3rd; min. 32°·6 on 24th. F 0, f 2.

CONG.—The largest R in any month for 18 years, except once in October and once in December.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, September, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	78·2	27	43·0	16	68·9	51·3	53·8	88	118·9	41·1	1·75	11	6·5
Malta	93·2	3	67·5	21, 29	81·0	73·8	...	73	155·0	..	·00	0	0·4
Lagos	87·5	26	70·3	13	84·7	73·8	72·8	80	156·2	68·2	5·40	19	7·5
Cape Town	76·8	16	39·5	11	65·0	49·8	50·3	76	...	...	1·96	10	4·9
Natal, Durban ...	76·0	27	50·0	3	68·3	61·5	59·2	76	...	...	1·91	8	6·0
Johannesburg	81·2	25	30·0	4	69·9	46·7	38·5	56	142·8	28·8	·39	3	2·3
Mauritius	78·4	27	59·3	19	76·3	63·1	59·9	73	149·8	52·2	1·42	15	5·7
Bloemfontein	83·8	27	29·8	3	70·5	45·8	36·7	51	...	...	1·25	5	3·9
Calcutta...	93·6	22	76·4	30	89·4	79·1	77·6	83	...	74·5	5·67	11	8·0
Bombay...	88·6	30	75·4	13	85·4	77·0	75·3	83	134·9	71·0	5·75	16	6·2
Madras	102·1	1	73·0	25	95·0	78·2	74·1	75	148·6	72·0	3·01	11	4·9
Colombo, Ceylon ...	88·7	22	70·9	10	86·3	75·0	72·5	77	159·4	66·3	2·82	13	6·3
Hongkong	90·9	9	71·4	21	84·7	76·7	74·0	81	...	...	14·57	18	7·2
Sydney	...	...	...	...	...	...	...	...	...	...	...	...	...
Melbourne	69·9	12	36·6	5	62·3	46·6	44·0	64	126·0	29·7	1·38	18	6·8
Adelaide	77·5	17	42·8	1	64·8	48·0	47·1	70	132·4	33·9	2·67	16	5·7
Perth	86·7	30	38·9	17	67·9	49·2	49·1	70	147·2	33·9	3·11	18	3·6
Coolgardie	86·6	13	39·0	18, 26	73·4	46·9	42·3	46	149·4	31·4	1·33	8	2·2
Hobart, Tasmania ..	65·4	18	32·0	11	58·2	42·3	39·4	63	128·4	25·9	1·92	20	6·3
Wellington	68·6	26	40·6	4	58·7	49·5	46·0	75	130·0	30·0	1·69	10	7·2
Auckland	64·0	6	42·0	10	60·2	49·1	48·0	79	133·0	45·2	1·76	14	6·7
Jamaica, Kingston ..	93·5	21	69·4	12	89·3	73·1	71·8	81	...	...	3·57	11	5·2
Grenada	88·0	10	71·0	22	84·9	75·5	...	79	137·0	...	9·06	21	4·5
Toronto	85·4	2	35·6	14	69·6	49·2	49·0	73	...	...	·97	6	3·4
Fredericton	85·0	3	29·0	28	65·8	43·3	...	77	...	...	2·15	8	4·5
St. John, N.B. ...	70·2	1	36·3	30	60·6	48·5	48·0	76	...	...	2·14	8	4·9
Edmonton, Alberta ...	75·2	12	25·9	23	65·2	39·0	...	69	130·0	21·2	·53	7	5·0
Victoria, B.C.	71·1	20	41·5	30	64·9	48·2	50·0	79	...	...	1·95	8	4·6

Johannesburg.—Bright sunshine 282·9 hours.

Mauritius.—Mean temp. of air 0°·4 below, dew point 0°·1 above, and R ·11 in. below, averages. Mean hourly velocity of wind 11·9 miles, or ·2 below average.

COLOMBO.—Mean temp. of air 80°·7, or 0°·5 below, of dew point 0°·9 below, and R ·68 in. below, averages. Mean velocity of wind 5·8 miles per hour.

HONGKONG.—Mean temp. of air 80°·4. Mean hourly velocity of wind 9·5 miles. Bright sunshine 146·8 hours.

Melbourne.—Mean temp. of air 0°·4 above, and R ·97 in. below, averages.

Adelaide.—Mean temp. of air 0°·6 below, and R ·72 in. above, averages.

Perth.—Temp. of air 0°·6 above average.

Coolgardie.—Temp. of air 1°·8 above, and R ·05 in. above, averages.

Hobart.—Temp. of air 0°·5 below, and R ·22 in. below, averages.

Wellington.—Mean temp. of air 2°·8 above, and R 2·55 in. below, averages. Bright sunshine 176·6 hours. Three grass frosts.

Auckland.—Cool and dry. R a little more than a third of the average

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Sir John Murray, K.C.B., F.R.S.

1841—1914.

John Murray, the famous naturalist and the world's leading authority on oceanography, was born at Coburg, Ontario, Canada, on March 3rd, 1841. His father was Robert Murray, who took an active part in Canadian politics. He received his early education in the Dominion, but having in 1858, when 17 years old, removed to Bridge of Allan in Scotland, he continued his education at the High School, Stirling, and at the University of Edinburgh, where he studied under Tait, Allman, Masson, Turner, Clerk Maxwell, and Lyon Playfair, and where he was associated as a student with such men as Robertson Smith, John Jackson, Robert Louis Stevenson, and others, who subsequently became famous in different walks of life. He also studied in France, Germany, and Belgium. For several years he helped his relative, John Macfarlane, of Coney Hill, in the formation of a large Natural History Museum at Bridge of Allan, and in 1868 he visited Spitzbergen and the Arctic Regions as a naturalist on board a Scottish whaler.

Four years later, in 1872, Murray entered upon the great enterprise with which his name will always be identified. In that year he was appointed one of the naturalists of her Majesty's ship *Challenger* during her circumnavigating voyage, 1872-76, for the exploration of the physical and biological conditions of the great ocean basins. In 1876 he became first assistant on the staff created by the Government to publish the scientific results of the Expedition, and when Sir Wyville Thomson died in 1882 he was installed as director and editor of the *Challenger* papers. These documents were most voluminous, running as they did to some fifty large royal quarto volumes, containing 29,500 pages, and illustrated by more than 3,000 plates and charts. Three furnish a narrative of the cruise, two deal with physics and chemistry, one with deep-sea deposits, two with botany, forty with zoology, and two gave a summary of results. Seventy-six scientists were engaged in its preparation. The whole of the collections were forwarded to Edinburgh, whence they were distributed for examination to the scientific experts. The editorial duties were entirely discharged in the city, and 32, Queen Street, where the Challenger Commission had its office, was for several years

frequented by the men of science from various parts of the world who were engaged in carrying out the work.

In a closing note to these immense labours, Murray summed up concisely his connection with the famous voyage of discovery. "In June, 1872, I was," he says, "appointed one of the naturalists of the *Challenger* when the Expedition was being fitted out. During the past twenty-three years my time has been wholly taken up with the work of the Expedition and in the study of those subjects which the Expedition was organised to investigate. The direction of the whole of the work connected with the publication of the scientific results passed unexpectedly into my hands, and I have done my best in the circumstances to place on permanent record a trustworthy account of the labours of this famous Expedition. It has been my earnest endeavour to complete the publications in a manner worthy of the naval position and scientific reputation of this great Empire. Notwithstanding the troubles, personal sacrifices and regrets necessarily connected with the work, it has been a pleasure and an honour to have taken part in explorations and researches which mark the greatest advance in the knowledge of our Planet since the celebrated geographical discoveries of the Fifteenth and Sixteenth Centuries." In 1880 and in 1882 he was in the *Knight Errant* and *Triton* Expeditions for the exploration of the Faroe Channel, voyages undertaken to supplement scientific facts ascertained on the *Challenger*.

From 1892 to 1894 he conducted many observations in the steam yacht *Medusa* on the physical and biological conditions of the lochs and seas of Scotland, founding and supporting marine stations for scientific research at Granton near Edinburgh and at Millport.

He also entered with great spirit into the project for establishing a meteorological observatory on the top of Ben Nevis, and became secretary of the Committee appointed to raise the funds. Largely through his enthusiasm £5000 was collected in a short time, and he superintended the erection of the buildings and the construction of the road to the top of the mountain. For many years he was vice-president and one of the secretaries of the Royal Society of Edinburgh, and served continuously on the Council of that Society for about twenty years. Sir John was associated with the Council of the Royal Scottish Geographical Society from its foundation in 1885, and acted as president from 1900 to 1904. During the same period he was president of the Scottish Natural History Society, and gave to that Society several grants to enable it to commence a scientific description of the valley of the Forth.

In the late nineties Sir John warmly advocated a renewal of Antarctic research, and his addresses on the subject did much to forward the organization and despatch of the expeditions that have taken place in recent years.

One of the most interesting of Sir John Murray's researches was a survey of the fresh-water lochs of Scotland. The Royal Societies of London and Edinburgh having in vain solicited the Government of

the day to undertake a bathymetrical exploration of these waters, Sir John Murray and Mr. F. Pullar—and after his death, his father, Mr. Laurence Pullar—executed the work. Mr. Pullar provided the greater part of the funds, and now some hundreds of Scottish lochs have been thoroughly examined, and the series of reports published in six volumes.

In conjunction with Dr. Johan Hjort, Sir John recently published a monumental work on the "Depths of the Ocean," in which was incorporated the practical results of deep-sea methods, derived from his last expedition, that on the *Michael Sars* in 1910.

Sir John took a deep interest in Meteorology, and from 1882 to 1909 served continuously on the Council of the Scottish Meteorological Society. He became one of the Trustees of the British Rainfall Organization in 1910. In this connection, Dr. Mill wrote: "Sir John Murray, of the *Challenger*, represents Scotland, and he represents also the sciences of the Earth's surface as no other man in the world could. To him, a friend of nearly 30 years' standing, I owe the best part of my scientific training, and his agreeing to take up this duty is a greatly valued expression of confidence on the part of the one man who knows all my scientific work from the beginning."

Sir John received honours innumerable from all parts of the world. He was created K.C.B. in 1898, and in the same year was made a Knight of the Prussian Order Pour le Mérite.

Sir John was a familiar figure both in Edinburgh and London. His bluff and hearty manner, breezy and redolent of the ocean on which so much of his life was spent, combined with his physical activity and mental alertness, were assets that made him welcome in whatever society he cared to move. His strong personality, his genial nature, and his keen sense of humour, made him hosts of friends, even among those for whom science had no attractions.

The accident which brought his life so suddenly and tragically to a close on March 16th, when motoring within a few miles of his Edinburgh home, overtook him in the full plenitude of his powers. Although three years past the allotted span, it seemed to his friends that many years of activity and usefulness lay before him, which accentuates the deep feelings of regret universally felt at his untimely death. R.C.M.

The Hon. Francis Albert Rollo Russell.

1849—1914.

We regret to announce the death in London, on March 30th, after a short illness, of Mr. Rollo Russell, of Steep, Petersfield. Born in July, 1849, he was the third son of the first Earl Russell, and was educated at Harrow and at Christ Church, Oxford. He was interested in the study of Meteorology and was the author of various publica-

tions, many of which were on meteorological subjects. He contributed in collaboration with the late Douglas Archibald, the chapter on "Sun Glows" to the Report on the Eruption of Krakatoa, and in 1893 published a work on "Hail," which he dedicated to his friend, Mr. Symons. He was also the author of various works in the domain of medico-climatology, and last year "The Early Correspondence of Lord John Russell" appeared from his pen. The Smithsonian Institution some years ago awarded him a silver medal for an essay on "The Atmosphere." He was one of the oldest Fellows of the Royal Meteorological Society, having been elected in 1868, at the early age of nineteen, and was a familiar figure at the meetings of that body. At the time of his death he was a member of Council of the Society, and was Vice-President in 1893 and 1894.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, the 18th March, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. C. J. P. Cave, President, in the chair.

Professor A. C. Seward, F.R.S., of Cambridge, gave a lecture on "Climate as Tested by Fossil Plants." Problems connected with the climates of past ages have long exercised the minds of scientific writers, both from an astronomical standpoint and from the point of view of the gradual development and wanderings of plants and animals since the earliest periods that have left recognisable records. An estimate of the value of plants as "thermometers of the ages" necessitates an inquiry into the power of acclimatisation of recent plants and their ability to respond to external stimuli; a comparison of land and water plants illustrates the plasticity of vegetative organs and the intimate relation between form, structure, and environment; similarly plants growing in dry places, or under other conditions unfavourable for the absorption of water, are characterised by certain structural features reflecting the circumstances in which they live. A comparison of individuals of the same species grown at high altitudes, at lower levels, or before continuous light, afford striking evidence of the power of adaptation. The difficulty of using fossil plants as tests of climate becomes increasingly great in proportion to the degree of difference between the extinct types and their nearest living relations. It is from the examination of petrified plants, the delicate tissues of which are almost perfectly preserved, that data may be obtained throwing light on climatic conditions. This method of inquiry is best illustrated by a consideration of some of the anatomical features of the leaves, stems and roots of trees which grew in the forests of the coal period; the form and arrangement of cells in the leaves indicate fairly bright sunlight; large spaces in the cortex of roots point to growth in swamps. The geographical distribution of plants during the latter part of the Palæozoic era affords evidence

of the existence of two botanical provinces, a northern province characterised by a luxuriant flora living under conditions more genial than those to which the poorer flora of the southern hemisphere was exposed. The presence or absence of rings of growth in the petrified stems of plants may afford evidence of the occurrence or absence of seasonal changes. A general survey of the Jurassic flora of the world leads to the conclusion that the climate was comparatively uniform, and in Arctic and Antarctic regions much more genial than at the present day. The fossil floras of more recent geological periods furnish clear evidence of sub-tropical conditions in Europe; in later times the occurrence of northern types in Britain heralds the approach of the Glacial period, and in post-glacial beds are found fragmentary remains of immigrants from neighbouring floras which have largely contributed to our present flora.

On the motion of Dr. H. N. Dickson, seconded by Captain H. G. Lyons, F.R.S., a hearty vote of thanks was accorded to Prof. Seward for his interesting and instructive lecture.

The following gentlemen were elected fellows of the Society :— Mr. E. W. Bliss, B.Sc., B.A., Mr. Ernest H. Chapman, M.A., B.Sc., Mr. Christopher Ogle, A.C.A., M.A., Mr. Archibald Pitkin, F.R.G.S., Capt. Harry Trowbridge, Mr. Reginald Vaughan, B.A.

THE WEATHER OF MARCH.

THE outstanding feature of the weather of March was the continued prevalence of unsettled, stormy, rainy, gloomy conditions in all parts of the United Kingdom. During the first ten days of the month the exceptional mildness that characterised February was again very pronounced, being most noticeable in the Southern half of England, including the Channel Islands, while in the North and East of Scotland temperature was but little in excess of the normal. During the last three weeks in nearly all districts temperature was under the average, but no severe cold spell was experienced. During the greater part of the month pressure was high in the Azores and in Iceland, an almost constant succession of depressions advancing directly over the United Kingdom. So exceedingly unsettled was the weather that there was rarely an interval of 48 hours in which gales or strong winds were not reported from some portion of the British Isles. In spite of the persistent rainfall there were few heavy daily falls reported, even in districts where amounts of 1·50 in. and upwards in the 24 hours are relatively common.

At the beginning of the month the thermometer rose to between 50° and 55° in many parts of our Islands, and during the first ten days hardly any frost was recorded. On the 6th a maximum of 59° was recorded at Southampton. On the 3rd, heavy rain fell in some western districts, the maximum falls reported being 1·85 in. at Rhiwbryfdir, and 1·74 in. at Delphi Lodge, Co. Mayo. On this day Poltalloch experienced a thunderstorm, while at some northern stations there was lightning only.

On the 5th when a new depression was approaching the north-west of Ireland further heavy rains were recorded, 1·92 in. at Rhiwbryfdir, 1·70 in. at Oughtershaw, and 1·23 in. at Invergarry. On the 8th, when a large low pressure area lay over Ireland and the adjacent parts of Wales, considerable quantities of rain fell very generally in the south and east, the maximum fall reported being 1·81 in. at Oaklands, Okehampton. At Studland, Dorset, 2·20 in. fell on the 9th, and at Totland Bay on this day 1 02 in. fell in six hours. About this time sharp frost was experienced in most districts, temperature in Scotland falling to 16° at Balmoral, and 22° at Fort Augustus on the 9th, and to 17° at West Linton on the 11th.

During the twelve days ending the 24th, the weather continued in a very unsettled condition with frequent strong winds and gales, accompanied in some cases by sleet, snow, hail and thunderstorms. Rainfalls exceeding an inch occurred almost daily during this period but few cases exceeding 1·50 in. were noted. On the 14th Blaenau-Hydfer recorded 1·54 in., and Shiel 1·65 in. On the 19th Old Garroch measured 1·64 in., and on the 24th Borrowdale Grange had 1·77 in. An easterly gale prevailed in Shetland on the 25th. Towards the close of the month the weather became much warmer, the temperature rising to 60° at Southport on the 30th, while on the last day of the month 65° was recorded at Lowestoft and Teignmouth, and 64° at Margate and Ilfracombe. During the last week some heavy daily rainfalls occured the maximum being noted at Rhiwbryfdir on the 30th when 2·11 in. fell. At the close of the month an exceptionally long rain spell remained unbroken in Ireland. At Darrynane, for example, March 31st was the 69th successive day with rain.

The general rainfall of the month expressed as a percentage of the average was: England and Wales, 185; Scotland, 123; Ireland, 164; British Isles, 161.

THE WETTEST MARCH IN LONDON IN 57 YEARS.

THE rainfall of last month at Camden Square amounted to 4·51 inches and was by far the heaviest recorded in March in 57 years over which the homogeneous rainfall record extends. Only on four previous occasions has the rainfall of March exceeded 3·00 inches, the previous highest fall being 3·69 inches in 1862. Rain fell on 25 days during the month and this number, though equalled in 1896 and 1909, has never been exceeded in March. Rain was actually falling for 102·4 hours which also constitutes a record for March during the 34 years in which records of duration have been kept up. The greatest duration previously recorded in the month of March was 94·0 hours in 1909. Only one month in the whole record had a greater duration than March 1914, viz. October, 1882, when rain fell for 103·5 hours. The only other instance of a duration of 100 hours in a month was June 1903 with 102·2 hours.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

METEOR OF JANUARY 19th.

I HAVE just read the note, with much interest, in the Magazine for February with reference to the brilliant meteor seen by Captain Chrystie, at Farnham, on January 19th. We also saw this phenomenon as we were proceeding, westerly, along the road between Midhurst and Petersfield, we were at a point about 16 miles due south of Farnham a few minutes after 7 p.m., and had a splendid view. The passage of the meteor was very obvious, and commenced almost on our right (over Farnham) and extended in a W.S.W. direction. The effect near at hand was very pronounced, the whole area about us being brilliantly lit up, rendering objects some distance away clearly visible.

Had I not seen the passage of the meteor I might have thought a strong searchlight had suddenly been directed upon us.

E. J. PLATT.

The Gardens, Borden Wood, Liphook, Hants, March 7th, 1914.

A NEW LOW RECORD OF THE BAROMETER IN NEW YORK.

THE great blizzard of the 1st and 2nd March was chiefly remarkable for the lowness of the barometer. At 8 p.m. on the 1st the barograph showed a reading of 28·39 in., breaking the record of January 13th, 1913, which was 28·60 in.

The original disturbance was first located over the East Gulf States with a centre of 29·66 in. Moving rapidly in a north-easterly direction it gained in intensity as it proceeded. In New York City the wind reached a velocity of 84 miles an hour, and the depth of snow was about 16 inches, while the temperature fell to 15° above zero.

During the height of this storm I happened to be in a train between Philadelphia and New York. The distance between the two cities is 80 miles, which is usually done in two hours by a fast express; on this occasion the train took 24 hours. For 8 hours it was stalled by the snow and had to be dug out. Then an engine with a snow plough was sent on to cut a path; the train followed an hour later. Telegraph poles and wires were down in all directions. Signals were useless, being clogged or frozen. Other trains moving in an opposite direction passed—white apparitions that crept like gliding ghosts. It was a spectacle not to be forgotten, and it was the worst blizzard since 1888.

C. DECKER.

New York, 65, West 50th Street.

HEAVY RAINFALL IN SURREY DURING FEBRUARY AND MARCH.

THE rainfall at Haslemere during February and March has been so great and so persistent that I venture to send you some particulars. *Symons's Meteorological Magazine* for March shows only three places in England, viz., Seathwaite, Ashburton and Keswick, with a greater rainfall for February than that at Haslemere. Haslemere is situate on the southern slope of Hindhead (893 feet) and has an altitude of about 550 feet; the sea is about 30 miles further to the south. It thus has a high rainfall; the average (22 years) is 35·57 in. at Hazelhurst.

The following figures give the rain in 1914 as compared with average:—

	1914.		Average.
February	7·11 in.	.....	2·55 in.
March.....	6·04 in.	.....	2·75 in.
Aggregate two months	13·15 in.	.....	5·30 in.

The highest previous aggregate of a consecutive February and March was 9·93 in. (1897). For this purpose I have examined the Penfold records which extend the period searched to cover about 40 years.

There were rainspells, February 6th to 23rd, 18 days, 7·05 in.; February 28th to March 15th, 16 days, 3·68 in.

Highest previous February rain, 7·89 in. in 1900.

Highest previous March rain, 5·75 in. (1887), 5·74 in. (1909) and 5·50 in. (1912).

THOMAS P. NEWMAN.

Hazelhurst, Haslemere, Surrey.

A NARROW SQUALL.

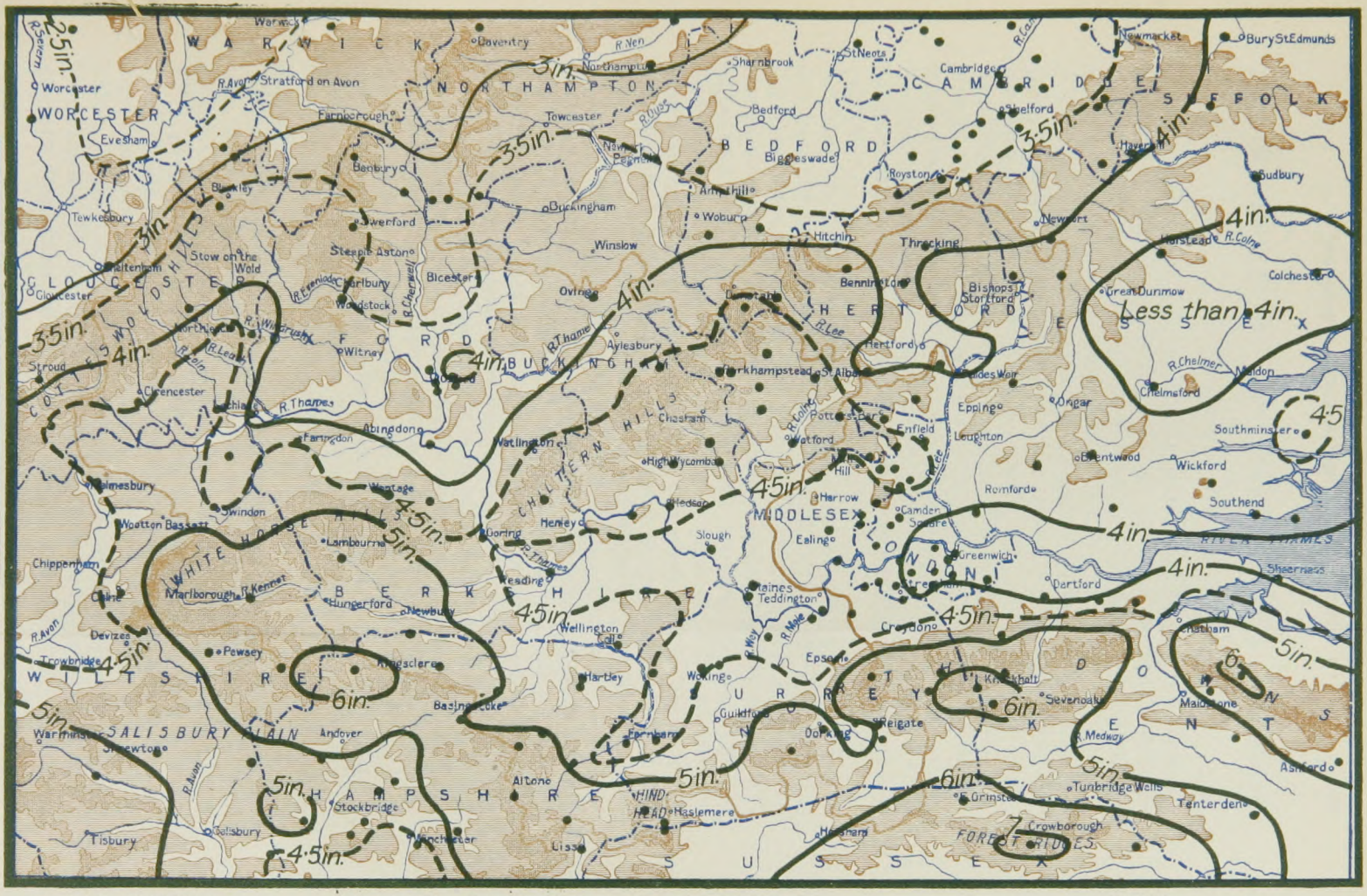
THE Royal Meteorological Society Phenological Committee have received from Mr. Alfred L. Holgreaves, of Hepple, Northumberland, the following note, which, though not adapted for our report, seems worth passing on to you:—

"On 19th July, 1913, a narrow strip of wind 1½ ft. wide, drove through a hedge, lifting newly cut hay 60 yards high, proceeded through a tree with great violence, blowing off the leaves of a hedge and tree, and upset a hay-cock in an adjoining field. It lasted some 10 minutes and was accompanied by great noise. I was informed by an old inhabitant such occurrences were frequent at Coquet Head in the Cheviots. I doubt they are all as narrow as this was."

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey, 18th March, 1914.

THAMES VALLEY RAINFALL — MARCH, 1914.



THE RAINFALL OF SOUTHERN SOUTH AMERICA.

By Herbert L. Solyom.

Within the limited area of extra-tropical South America we find such a variety of rainfall conditions with the cause of each so definitely marked that the region under consideration might well be used to illustrate almost all the well recognised types.

That part of the continent has the general form of a right-angled triangle with the shorter leg on the tropic of Capricorn, the longer leg along the west coast and the hypotenuse along the east coast. The lofty Andean mountain ranges run from north to south near the west coast, and the Brazilian coast ranges under various names extend south-westward almost to the mouth of the Rio de la Plata, while between the two and on the southward to Tierra del Fuego stretch substantially level plains interrupted by one or two minor mountain ranges.

There are two great air currents in this region, a north-easterly one from the tropical part of the Atlantic, and a westerly one from the temperate section of the Pacific. The former is part of the circulation around the South Atlantic high-pressure area and the latter part of the general westerly wind between the South Pacific high and the Bellingshausen Sea low. Each of these currents is forced upward by the mountains near the coast and in consequence precipitates a great deal of its moisture as orographic rainfall and descends on the other side with a considerably diminished vapour content. The north-east current being the warmer has the greater carrying capacity, and the mountains along the east coast are considerably lower than those of the west coast, so that we are not surprised to find that even after supplying a heavy rainfall on the Brazilian coast it penetrates the continent as a damp wind, while the west wind from the Pacific loses practically all of its moisture on the Chilean slope of the Andes and the highlands of western Patagonia and reaches the plains as a dry wind. Though this west wind is at a low temperature, and consequently has but a small capacity for moisture, its mean velocity is great, so that in a given time it may bring in almost as much water vapour as the highly charged but more slowly moving north-east wind from the tropical Atlantic.

During the winter months (May to September) a low pressure area is developed along the Chilean coast from latitude 38° northward and a high pressure area over the interior plains, about latitude 37°. Between these two a north or north-north-west wind is set up which, being warmer than the general west wind, naturally carries more moisture and produces more rainfall. We get, therefore, a winter rainfall maximum in central Chile and a winter rainy season in northern Chile, while even in the far south an increased barometric gradient from north to south gives greater velocity to the prevailing

west winds and consequently results in a slightly greater precipitation in winter than in summer.

In marked distinction to this is the rainfall in northern and north-eastern Argentina, where the north-easterly winds encounter the east slope of the Andean ranges. Here we find a pronounced low pressure area developed during the summer (October to March). This produces a rising current throughout the piedmont region causing not only an intensification of the north-east wind, but an additional northerly indraught from the warm and moist central portion of Brazil. The result is a heavy summer rainfall followed by a long dry winter season during which the principal wind is a föhnlike current coming out from a winter anticyclone in the plateau region.

At frequent intervals during the summer fragments of the above mentioned piedmont low detach themselves from the principal area, and move across the continent in an easterly or north-easterly direction deflecting the normal north-east current into clockwise cyclonic spirals. These moving cyclones are the chief cause of rain in the north-eastern part of the region we are considering and their influence is felt as far south as Cape Corrientes (latitude 38° S.), and as far west as the Cordoba mountains in longitude 65° W. Another type of cyclone which contributes to the rainfall of eastern Argentina, Uruguay and southern Brazil, is one which appears first in the tropical interior of the continent and moves successively south-west, south and south-east disappearing in the Atlantic about latitude 35° S. These are primarily winter phenomena but have been observed as early as April and as late as October. The rain they cause is general and heavy. One more cause of precipitation remains to be noted. The anticyclones which follow one another from west to east in rapid succession around the high-pressure belt of the southern hemisphere cross the South American continent diagonally from about 40° S. on the west coast to about 32° or 35° S. on the east coast. The heavy outflowing air from these centres seems to run under the warmer and moister air overlying Uruguay and the south-east Argentine provinces and lift it. On the forward edge of the disturbance this occurs so rapidly that the moisture is condensed and precipitated giving rise to a fringe of showers around the north-east perifery of the anticyclone. The anticyclonic showers are common between latitudes 30° and 40° S., and longitudes 55° and 65° W., and occur at all seasons of the year.

The rainfall in the east of the continent and that in southern Chile are substantially uniform throughout the year though in the former it shows a slight summer maximum and in the other a slight winter maximum. There is however considerable variation from year to year. In northern Chile and north-western Argentina on the other hand there are distinct rainy and dry seasons, the rainy season being winter in the former case and summer in the latter, but the variation from year to year is not great except in the arid regions where a

single heavy shower may constitute 75 per cent. of the total rainfall for five or six years.

It will thus be seen that the north-east current above referred to supplies the moisture for the rain in Uruguay, southern Brazil and northern Argentina and in the narrow strip in the Andean highlands of northern Chile where snow and rain occur. The westerly Pacific wind supplies all of Chile with the above exception and the western half of Patagonia. Between the regions of the Atlantic and the Pacific rains stretches a semiarid strip in the shape of a long, narrow wedge with the point on the east coast near latitude 48°, and the base in the extreme north of Chile. The centre line crosses the Andes in about latitude 33°. In this region such rains as do occur affect very limited areas and are due to purely local disturbances of the atmospheric equilibrium

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

May 4th, 1911.

Starting Point.	Country.	A (H_c.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles.	F
Manchester	England ..	6·9	—65	9·4	—66	103	S.E.
Pyrton Hill 7 a.m.	England ..	6·5	—61	8·2	—63	57	E. by S.
Pyrton Hill 7 p.m.	England ..	—	—	6·6	—65	—	E.N.E.
Lindenberg	Germany..	7·4	—76	9·7	—?	37	N.N.E.
Paris	France ...	7·1	—77	8·8	—75	66	E. by N.
Strassburg.....	Germany..	7·2	—80	9·4	—64	22	E.N.E.
Munich	„ ..	7·3	—72	8·6	—63	6	N.
Pavia	Italy	7·5	—81	9·3	—78	15	S.W. by S.
Pavlovsk	Russia	6·4	—64	7·1	—62	17	S.E.
Nishni Olchedaeff	„ ..	6·6	—83	7·0	—80	35	N.N.W.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

A deep depression was moving rapidly toward the Norwegian Coast, while the barometer was high to the east of the Baltic and over Spain.

The figures do not show any great departure from the average values for the date.

RAINFALL TABLE FOR MARCH, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·70	4·51
Tenterden	*Kent*	51 4	*0 41	190	1·95	5·13
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·95	5·19
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·17	5·31
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·45	3·64
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·69	2·65
Shoeburyness	*Essex*	51 31	*0 48	13	1·19	4·23
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·71	4·16
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·57	3·50
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·74	7·92
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·30	5·15
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·01	3·81
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·19	3·66
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·89	2·51
Boston	*Lincolnshire*	52 58	0 1	11	1·47	2·54
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·70	1·79
Macclesfield	*Cheshire*	53 15	2 7	501	2·50	4·83
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	2·11	3·27
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	5·17	7·70
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·92	2·53
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·84	2·15
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·10	2·08
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	10·63	14·11
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·89	7·06
Haverfordwest	*Pembroke*	51 48	4 58	90	3·16	5·57
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·04	6·32
Llandudno	*Carnarvon*	53 20	3 50	72	2·13	3·12
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·33	5·58
Marchmont House	*Berwick*	55 44	2 24	498	2·64	3·47
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·62	6·66
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·61	4·10
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	5·41	6·89
Mull (Quinish)	,,	56 34	6 13	35	4·28	3·92
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·06	3·30
Braemar	*Aberdeen*	57 0	3 24	1114	2·87	4·36
Aberdeen (Cranford)	,,	57 8	2 7	120	2·65	3·25
Cawdor	*Nairn*	57 31	3 57	250	2·35	2·56
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·79	2·19
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·29	5·16
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·64	4·20
Wick	*Caithness*	58 26	3 6	77	2·24	3·02
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·51	8·87
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·64	3·83
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·99	4·75
Ennistymon House	*Clare*	52 57	9 18	37	3·24	6·37
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·28	3·74
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·59	4·40
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·98	2·10
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·64	3·93
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·36	6·81
Cong (The Glebe)	,,	53 33	9 16	112	3·80	5·83
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·33	5·38
Seaforde	*Down*	54 19	5 50	180	2·84	4·73
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·73	4·07
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·98	5·44

RAINFALL TABLE FOR MARCH, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
+2·81	265	·72	8	25	5·19	7·43	+2·24	143	25·11	Camden Square
+3·18	264	·95	19	24	5·99	9·58	+3·59	160	27·64	Tenterden
+3·24	266	·67	9	22	6·71	9·91	+3·20	148	30·48	Patching
+3·14	245	·80	10	26	7·20	10·25	+3·05	142	31·87	Cadland
+2·19	251	·60	8	28	4·85	5·78	+ ·93	119	24·58	Oxford
+ ·96	157	·42	7	24	5·27	4·67	— ·60	89	25·17	Croyland Abbey
+3·04	355	·92	25	25	3·71	5·95	+2·24	160	19·28	Shoeburyness
+2·45	243	·53	9	22	5·00	8·06	+3·06	161	25·40	Westley
+1·93	223	·52	9	24	4·51	6·66	+2·15	148	23·73	Geldeston
+5·18	289	·93	8	29	9·28	14·67	+5·39	158	38·27	Polapit Tamar
+2·85	224	·76	8	25	7·74	9·85	+2·11	127	33·54	Rousdon
+1·80	190	·38	8	24	6·46	7·49	+1·03	116	29·81	Stroud
+1·47	167	·54	7	22	6·87	7·50	+ ·63	109	32·41	Wolstaston
+ ·62	133	·36	7	22	6·12	4·85	—1·27	79	28·98	Coventry
+1·07	173	·30	7	25	4·54	5·00	+ ·46	110	23·35	Boston
+ ·09	105	·25	11	20	5·04	3·73	—1·31	74	24·46	Hodsock Priory
+2·33	193	·66	24	26	7·46	9·34	+1·88	125	34·73	Macclesfield
+1·16	155	·44	5	25	6·73	6·85	+ ·12	102	32·70	Southport
+2·53	149	1·23	30	27	16.31	20·32	+4·01	125	61·49	Arncliffe
+ ·61	132	·45	27	19	5·52	5·17	— ·35	94	26·87	Ribston Hall
+ ·31	117	·48	11	24	5·32	4·75	— ·57	89	26·42	Hull
— ·02	99	·41	15	25	5·63	5·41	— ·22	96	27·94	Newcastle
+3·48	133	1·32	13	27	35·03	47·38	+12·35	135	129·48	Seathwaite
+4·17	244	·98	11	29	9·61	12·98	+3·37	135	42·28	Cardiff
+2·41	176	·60	11	24	11·27	13·01	+1·74	115	46·81	Haverfordwest
+3·28	208	·75	20	27	10·04	14·88	+4·84	148	45·46	Gogerddan
+ ·99	146	·40	15	20	6·75	7·83	+1·08	116	30·36	Llandudno
+2·25	168	·96	13	25	10·85	16·94	+6·09	156	43·47	Cargen
+ ·83	132	·52	15	20	7·19	7·43	+ ·24	103	33·76	Marchmont
+3·04	184	·71	1	24	12·27	17·43	+5·16	142	49·77	Girvan
+1·49	157	·48	30	21	8·84	11·03	+2·19	125	35·97	Glasgow
+1·48	127	·70	2	25	18·46	23·39	+4·93	127	68·67	Inveraray
— ·36	92	·58	2	23	14·28	16·44	+2·16	115	56·57	Quinish
+1·24	160	·69	20	21	5·98	7·18	+1·20	120	28·64	Dundee
+1·49	152	·43	13, 14	23	8·34	11·46	+3·12	138	34·93	Braemar
+ ·60	123	·42	23	21	7·37	7·21	— ·16	98	32·73	Aberdeen
+ ·21	109	·66	2	11	6·69	6·25	— ·44	93	29·33	Cawdor
—1·60	58	·35	5	21	13·57	10·29	—3·28	76	44·53	Fort Augustus
—2·13	71	·65	17	23	24·24	28·30	+4·06	117	83·93	Bendamph
+1·56	159	·63	2	21	7·97	9·65	+1·68	121	31·90	Dunrobin Castle
+ ·78	135	·39	24	26	6·95	7·52	+ ·57	108	29·88	Wick
+4·36	197	1·01	28	31	15·44	24·86	+9·42	161	54·81	Killarney
+1·19	145	·86	28	23	9·60	11·38	+1·78	119	39·57	Waterford
+1·76	159	·52	3	25	9·76	14·18	+4·42	145	39·43	Castle Lough
+3·13	196	·57	13	29	10·98	17·71	+6·73	161	46·52	Ennistymon
+1·46	164	·87	28	25	8·22	10·07	+1·85	123	34·99	Courtown Ho.
+1 81	170	·58	28	25	8·29	10·68	+2·39	129	35·92	Abbey Leix
+ ·12	106	·24	28	26	6·05	5·58	+ ·47	92	27·68	Dublin
+1·29	149	·45	10, 13	25	8·41	10·30	+1·89	122	36·15	Mullingar
+2·45	156	·64	17	30	13·91	19·06	+5·15	137	52·87	Enniscoe
+2·03	153	·80	28	28	12·31	18·88	+6·57	154	48·90	Cong
+2·05	162	·42	1	27	10·40	14·47	+4·07	139	42·71	Markree
+1·89	167	1·00	28	23	9·06	10·21	+1·15	113	38·91	Seaforde
+1·34	149	·54	14	25	8·48	11·09	+2·61	131	37·56	Dundarave
+2·46	182	·54	11	28	9·12	13·39	+4·27	147	39·38	Omagh

SUPPLEMENTARY RAINFALL, MARCH, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	5·84	XI.	Lligwy	2·69
,,	Ramsgate	4·24	,,	Douglas	5·51
,,	Hailsham	5·88	XII.	Stoneykirk, Ardwell House...	4·51
,,	Totland Bay, Aston House...	5·45	,,	Dalry, The Old Garroch.....	10·32
,,	Stockbridge, Ashley..	4·68	,,	Beattock, Kinnelhead	8·21
,,	Grayshott	5·30	,,	Langholm, Drove Road	6·19
III.	Harrow Weald, Hill House...	4·46	XIII.	Meggat Water, Cramilt Lodge	6·54
,,	Caversham, Rectory Road ...	4·24	,,	North Berwick Reservoir.....	...
,,	Pitsford, Sedgebrook.....	2·63	,,	Edinburgh, Royal Observaty.	2·84
,,	Woburn, Milton Bryant.....	3·97	XIV.	Maybole, Knockdon Farm ...	3·36
,,	Chatteris, The Priory.....	2·95	XV.	Ballachulish House	5·22
IV.	Elsenham, Gaunts End	4·05	,,	Campbeltown, Witchburn ..	5·37
,,	Colchester, Hill Ho., Lexden	3·94	,,	Holy Loch, Ardnadam.....	8·66
,,	Ipswich, Rookwood, Copdock	4·48	,,	Islay, Eallabus	4·94
,,	Blakeney.....	2·27	,,	Tiree, Cornaigmore	3·88
,,	Swaffham	3·30	XVI.	Dollar Academy	4·36
V.	Bishops Cannings	4·51	,,	Balquhidder, Stronvar.....	8·19
,,	Wimborne, St. John's Hill ...	5·58	,,	Glenlyon, Meggernie Castle..	6·82
,,	Ashburton, Druid House.. ...	8·99	,,	Blair Atholl	4·23
,,	Cullompton	6·60	,,	Coupar Angus	3·45
,,	Lynmouth, Rock House	7·75	,,	Montrose, Sunnyside Asylum.	3·65
,,	Okehampton, Oaklands.....	9·93	XVII.	Alford, Lynturk Manse	3·46
,,	Hartland Abbey.....	5·73	,,	Fyvie Castle	3·55
,,	Probus, Lamellyn.....	5·82	,,	Keith Station	3·42
,,	North Cadbury Rectory.....	5·34	XVIII.	Rothiemurchus	2·05
VI.	Clifton, Pembroke Road.....	4·82	,,	Loch Quoich, Loan	11·60
,,	Ross, The Graig	3·05	,,	Drumnadrochit	2·79
,,	Shifnal, Hatton Grange.....	2·39	,,	Skye, Dunvegan	3·81
,,	Droitwich.....	2·44	,,	Lochmaddy Bayhead	5·30
,,	Blockley, Upton Wold.....	3·73	,,	Glencarron Lodge	6·09
VII.	Market Overton.....	2·88	XIX.	Invershin	3·27
,,	Market Rasen	1·70	,,	Melvich	3·98
,,	Bawtry, Hesley Hall	1·33	,,	Loch Stack, Ardchullin	6·93
,,	Derby, Midland Railway.....	2·27	XX.	Skibbereen Rectory	7·49
,,	Buxton	5·40	,,	Dunmanway, The Rectory ..	8·73
VIII.	Nantwich, Dorfold Hall	3·45	,,	Glanmire, Lota Lodge, No. 1	5·21
,,	Chatburn, Middlewood	4·85	,,	Mitchelstown Castle.....	5·64
,,	Cartmel, Flookburgh	5·04	,,	Darrynane Abbey.....	8·23
IX.	Langsett Moor, Up. Midhope	4·46	,,	Clonmel, Bruce Villa	4·37
,,	Scarborough, Scalby	3 02	,,	Newmarket-on-Fergus, Fenloe	4·31
,,	Ingleby Greenhow	2·26	XXI.	Laragh, Glendalough	6·74
,,	Mickleton	3·20	,,	Ballycumber, Moorock Lodge	3·06
X.	Bellingham, High Green Manor	3·74	,,	Balbriggan, Ardgillan	2·07
,,	Ilderton, Lilburn Cottage ...	2·96	XXII.	Woodlawn	5·53
,,	Keswick, The Bank.....	6·15?	,,	Westport, St. Helens	5·10
XI.	Llanfrechfa Grange	4·77	,,	Dugort, Slievemore Hotel ...	7·35
,,	Treherbert, Tyn-y-waun	13·57	,,	Mohill Rectory	5·76
,,	Carmarthen, The Friary	6·12	XXIII.	Enniskillen, Portora.....	5·66
,,	Castle Malgwyn [Llechryd]...	4·65	,,	Dartrey [Cootehill]	4·60
,,	Crickhowell, Tal-y-maes.....	6·60	,,	Warrenpoint, Manor House ..	4·58
,,	New Radnor, Ednol	5·32	,,	Banbridge, Milltown	...
,,	Birmingham WW., Tyrmynydd	9·74	,,	Belfast, Cave Hill Road	4·21
,,	Lake Vyrnwy	...	,,	Glenarm Castle..... ...	5·62
,,	Llangyhanfal, Plâs Draw.....	2·80	,,	Londonderry, Creggan Res...	5 00
,,	Dolgelly, Bryntirion.....	9·26	,,	Dunfanaghy, Horn Head ...	4·57
,,	Bettws-y-Coed, Tyn-y-bryn...	...	,,	Killybegs	8·04

METEOROLOGICAL NOTES ON MARCH, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The wettest March in the 57 years' record and with the greatest duration of R of any month, but October, 1882, in the past 34 years (see p. 50). On 7th—9th the R amounted to 1·65 in,, and the duration to 37·5 hours. Mean temp. 44°·2 or 2°·1 above the average. Duration of sunshine 78·5* hours, and of R 102·4 hours. Evaporation ·52 in. Shade max. 65°·5 on 31st; min. 28°·4 on 11th and 22nd. F 5, f 15.

TENTERDEN.—The wettest March for over 50 years. Duration of sunshine 108† hours. Shade max. 63°·5 on 31st; min. 28°·5 on 11th. F 5, f 16.

TOTLAND BAY.—The wettest March known here. Mean temp. 45°·1. Duration of sunshine 107·2* hours. Shade max. 65°·2 on 31st, the highest March reading in 28 years; min. 33°·3 on 22nd. F 0, f 8.

MILTON BRYAN.—A wretched month with R 1·13 in. above the average. Shade max. 64°0 on 31st; min. 25°0 on 11th. F 14.

IPSWICH, COPDOCK.—A constant succession of cyclonic disturbances, but little real cold. Mean temp. 43°·3. Duration of sunshine 106·8* hours, and of R 101 hours. Shade max. 64°·5 on 31st; min. 29°·8 on 11th. F 4, f 15.

POLAPIT TAMAR.—The heaviest R for March in 45 years. A rain spell lasted from February 26th to March 26th, 29 days. Shade max. 61°·1 on 31st; min. 28°·0 on 22nd. F 4, f 11.

NORTH CADBURY.—Very stormy month but not a cold one. Harsh and disagreeable from 9th onward, until 31st which was a beautiful warm day. Shade max. 63°·0 on 31st; min. 27°·0 on 11th. F 5, f 15.

HODSOCK PRIORY.—Shade max. 60°·2 on 31st; min. 27°·7 on 10th F 9, f 17

SOUTHPORT.—Duration of sunshine 105·0* hours, and of R 89·9 hours. Mean temp. 43°·5 or 2°·2 above average, Evaporation ·73 in. Shade max. 60°·0 on 30th; min. 31°·0 on 20th and 28th. F 2, f 14.

HULL.—A continuation generally of the mild weather of February, but more frequent R and low bar. readings. Duration of sunshine 72·0* hours. Shade max. 61°·0 on 31st; min. 29°·0 on 11th. F 3, f 14.

CARMARTHEN.—Very wet month all through. Every kind of vegetation backward, and garden and corn setting late because of wet ground.

LLANDUDNO.—Shade max. 57° on 29th and 30th; min. 33° on 20th and 28th.

MARCHMONT.—Duration of sunshine 94·1 hours on 24 days. Shade max. 58° on 31st; min. 24° on 10th. F 12, f 18.

ABERDEEN.—Cold and wet, with high winds from W. and S.W. Shade max. 58° on 31st; min. 22° on 9th. F 21, f 23.

FORT AUGUSTUS.—Shade max. 55°·4 on 30th; min. 21°·4 on 9th. F 12.

LOCH STACK.—Duration of sunshine 86·4* hours.

DARRYNANE ABBEY.—The wettest March in 35 years' record. There have been 69 successive rain days from January 22nd to March 31st.

DUBLIN.—An unsettled, wet and windy month. Mean temp. 43°·9 or 0°·4 above the average. A great preponderence of S.W., W. and S. winds. Shade max. 59°·0 on 31st; min. 29°·8 on 20th. F 4, f 8.

MOHILL.—A rain spell of 57 days lasted from January 23rd to March 20th. Shade max. 59° on 31st; min. 26° on 10th. F 14, f 15.

OMAGH.—A rain spell of 55 days with 10·70 in. of R lasted from January 23rd to March 18th. Shade max. 57° on 29th and 31st; min. 26° on 10th. F 9.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, October, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, CamdenSquare	70·3	2	36·7	25	61·5	47·2	49·7	91	105·4	35·2	3·11	15	7·4
Malta	80·2	9	59·9	16	78·2	67·1	...	76	147·0		12·81	4	1·1
Lagos	..	...	...	...	...	...	..	..	...	...	...	...	...
Cape Town	86·9	16	45·6	3	69·5	52·5	51·7	71	...	...	1·50	12	5·1
Natal, Durban ...	75·0	29	54·0	24	69·6	61·5	60·8	77	...	...	5·06	17	7·0
Johannesburg	80·9	11	41·0	16	72·2	51·1	45·7	64	146·2	38·8	4·59	12	3·5
Mauritius	85·4	17	58·2	9	81·4	63·7	62·5	73	150·9	51·4	1·04	14	4·7
Bloemfontein ...	87·6	28	36·3	24	75·9	48·9	42·5	50	...	...	1·27	4	3·2
Calcutta...	90·8	7	65·8	29	86·8	73·6	72·7	79	...	61·5	6·64	6	4·2
Bombay... ...	91·0	23	73·3	28	88·4	77·1	75·1	79	140·0	65·8	2·35	5	3·3
Madras	95·1	16	69·1	31	88·6	74·6	73·2	81	142·4	67·1	28·28	18	5·7
Colombo, Ceylon ...	88·0	23	71·6	23	85·5	74·9	73·7	81	162·2	67·3	6·46	18	7·2
Hongkong	85·5	8	67·9	17	80·3	72·2	63·4	64	...	...	3·55	6	3·5
Sydney	92·0	22	49·9	18	73·3	58·3	53·2	67	145·1	36·6	1·14	13	5·2
Melbourne	88·3	10	39·1	9	67·7	49·3	46·8	63	139·9	33·2	1·47	14	6·3
Adelaide	96·9	9	42·0	31	74·8	53·8	49·7	57	147·0	35·8	2·45	10	4·9
Perth	90·4	1	44·0	10	67·4	51·9	49·4	68	150·9	39·8	3·31	14	4·7
Coolgardie	92·8	8	42·4	26	75·8	50·8	44·4	46	152·8	39·6	1·34	7	3·6
Hobart, Tasmania ..	84·5	10	37·0	16	64·7	47·3	43·0	58	135·0	34·1	1·94	15	6·7
Wellington ...	66·2	31	35·4	4	59·3	50·4	49·0	81	130·0	34·0	4·86	22	8·3
Auckland	72·0	30	43·5	10	63·0	52·0	51·0	78	135·0	41·0	3·69	15	6·5
Jamaica, Kingston ..	92·9	20	69·5	30	89·8	72·5	70·3	78	...	...	1·41	7	4·6
Grenada	87·0	sev.	71·0	25	84·1	74·4	...	82	136·0	...	10·98	21	5·0
Toronto	81·4	6	26·9	31	59·7	43·6	44·0	80	..	...	2·46	12	5·3
Fredericton	75·8	7	26·0	23	59·3	46·4	...	89	...	...	7·42	18	8·0
St. John, N.B. ...	69·3	3	13·2	31	59·6	50·2	51·0	87	...	...	5·95	19	8·0
Edmonton, Alberta ...	77·0	1	12·8	30	46·2	27·1	...	75	126·9	4·2	·40	9	6·3
Victoria, B.C.	62·2	2	35·0	5	54·4	43·1	45·7	88	...	...	3·63	15	6·2

MALTA.—On the 16th a cloud burst, in three hours 11·57 in. of R fell, the largest daily rainfall in 30 years.

Johannesburg.—Bright sunshine 266·0 hours.

Mauritius.—Mean temp. of air 0°·1 below, dew point 0°·9 above, and R ·24 in. below, averages. Mean hourly velocity of wind 9·2 miles, or 1·8 below average.

COLOMBO.—Mean temp. of air 80°·2, or 0°·2 above, of dew point 0°·3 below, and R 9·40 in. below, averages. Mean velocity of wind 4·6 miles per hour. TSS on three days.

HONGKONG.—Mean temp. of air 76°·1. Mean hourly velocity of wind 11·7 miles. Bright sunshine 266·9 hours.

Melbourne.—Mean temp. of air 1°·0 above, and R 1·17 in. below, averages.

Adelaide.—Mean temp. of air 2°·4 above, and R ·71 in. above, averages.

Perth.—Temp. of air 1°·3 below, and R above, averages.

Coolgardie.—Temp. of air 0°·3 below, and R ·5 in. above, averages.

Hobart.—Temp. of air 2°·1 above, and R ·30 in. below, averages.

Wellington.—Mean temp. of air 0°·7 above, and R ·65 in. above, averages. Bright sunshine 140 hours.

Auckland.—A seasonable month.

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NAPIER TERCENTENARY CELEBRATION, 1914.

To celebrate the tercentenary of the publication in 1614 of John Napier's *Logarithmorum Canonis Mirifici Descriptio* it is proposed to hold a Congress in Edinburgh, on Friday, 24th July, 1914, and following days. The celebration is being held under the auspices of the Royal Society of Edinburgh, on whose invitation a General Committee has been formed, and will be opened with an Inaugural Address by Lord of Appeal Sir J. Fletcher Moulton, F.R.S., LL.D. (Edin.), &c., followed by a Reception given by the Right Honourable the Lord Provost, Magistrates, and Council of the City of Edinburgh. On the Saturday and Monday the historical and present practice of computation and other developments closely connected with Napier's discoveries and inventions will be discussed.

A Memorial Service will be held in St. Giles' Cathedral on the Sunday.

Merchiston Castle, the residence of Napier, has long been occupied by the well-known public school, which draws pupils from all parts of the British Empire. The Governors of the School have kindly invited the members of the Congress to visit the Castle and Grounds on the Saturday afternoon.

Relics of Napier, collected by Lord Napier and Ettrick and other representatives of the family, will also be on view; and it is intended to bring together for exhibition books of tables and forms of calculating machines, which may reasonably be regarded as natural developments of the great advance made by Napier.

Individuals, Societies, Universities, Public Libraries, &c., may become Founder Members on payment of a minimum subscription of £2; and each Founder Member will receive a copy of the Memorial Volume, which will contain addresses and papers read before the Congress, and other material of historic and scientific value. It is important to secure as many Founder Members as possible, so that a volume may be brought out worthy of the memory of Napier.

Ordinary subscribers attending the Celebration may receive copies of the Memorial Volume at a reduced price. Those wishing to attend the Celebration are requested to communicate with Dr. C. G. Knott, General Secretary, Royal Society of Edinburgh.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 22nd, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. N. Dickson, Vice-President, in the chair

Mr. J. E. Clark and Mr. R. H. Hooker presented their joint report on the phenological observations from December, 1912, to November 1913. This dealt with the dates of the flowering of plants, the song and migration of birds, the appearance of insects, and also the character of farm crops. Considering England as a whole, the main feature of the weather, so far as it affected crops, was the cold wet summer of 1912, the abundant precipitation during the spring, which resulted in a bountiful hay crop, and the subsequent dry summer. October and November, 1912, were both fairly dry, so that the autumn was, on the whole, favourable for wheat sowing; but this operation was very behindhand, owing to the 1912 harvest having been very late, so that large areas of wheat remained to be sown at the end of November, when the rain set in. The later periods of the cereal year were probably not unsuitable to the wheat, and in the result the crop was just under average. Barley, also, in England, was not much below average. Oats, which require plenty of rain in the early summer, were very deficient in England, but satisfactory in the moister Scotland and Ireland. Potatoes were a heavy crop everywhere. Roots were deficient in England, especially in the drier Midlands; in Scotland and Ireland they were excellent. Hops were poor and a feature of the season was the unusual difficulty of estimating the yield until the hops were picked. The hay crop was abundant, and an interesting feature is that in the South and Midlands the hay from clovers and rotation grasses was relatively much better than that from permanent meadow land. Harvesting began in England at about the average time—a shade earlier in the case of wheat; a little later in the case of oats. In Wales it was a little later. There was a tendency for the dates to be rather earlier on the eastern side of the country than in the west. The duration of the harvest was also about an average, and rather longer than usual in Wales. In this case also it was distinctly shorter on the east than on the west. The explanation is that in the moister and somewhat later western west and north the broken weather set in in September before operations were completed, whereas in the south the corn had mostly been got in before the conditions became unfavourable. The quality of the crops was good in the case of wheat and barley, but that of oats was less satisfactory. In the south-west of England three special features were the destructive prevalence of green fly on fruit trees, the immense number and late survival of wasps, and the scarcity of most butterflies. Several observers, however, note the reappearance of clouded yellows. The further destructive spread of the "Isle of Wight disease" among

bees, which has practically cleared them from many parts of England, S.E. especially, to the serious detriment of fruit prospects, was also recorded.

Col. H. E. Rawson said he had often noticed the wonderfully accelerated growth of certain plants immediately after a thunderstorm. He had also been carrying out experiments to see the effect of sunshine at certain hours of the day on different plants. Tomatoes, for example, made rapid growth when receiving sunshine in the early morning, and suffered no ill effects if there was no sunshine in the latter part of the day.

Mr. E. G. C. Barton said that the electrification of the air has a great effect in accelerating the growth of plants, and he thought it might perhaps account for some of the accelerated growths mentioned in the paper. He believed that a bad plant season was almost invariably followed by a good season.

Mr. J. Hopkinson said that in Hertfordshire, in which county he was specially interested, a wet season was favourable to all crops. The year in question was generally wet over Hertfordshire and the yield of crops was 2 per cent. better than the average for ten years, while over England as a whole the yield was 1 per cent. less than the average.

Mr. F. Campbell Bayard and Mr. L. C. W. Bonacina also spoke, and Dr. H. N. Dickson warmly thanked the authors for their continued work on behalf of the Society.

Mr. Hooker, in replying, said that he had found that a wet summer was usually followed by a poor crop in the following year, and *vice versa*, except in the case of potatoes. He essayed a forecast that, owing to a comparatively dry season in 1913, all crops ought to be good in the present year, except perhaps clover which prefers either cool or damp conditions.

A paper by Mr. A. T. Bamford, Superintendent of the Colombo Observatory, Ceylon, "On a small Anemometer for Tropical Use," was read by Mr. Marriott. In the discussion that followed Col. H. E. Rawson asked if particular attention was paid to the kind of oil used in the Robinson anemometer. He was of opinion that in any instruments with rotating cups the kind of oil used should be most carefully analysed.

Dr. C. Chree doubted if this instrument was any improvement on many anemometers already in use. In twenty years' experience he had found the cup anemometer to show a remarkably constant ratio. He thought that the kind of oil used might have some slight effect on the records in light winds up to say four miles per hour, but in winds of greater velocity the effect would be negligible.

Mr. W. B. Tripp also spoke.

The following gentlemen were elected Fellows of the Society:—Major C. J. Burke, Major E. M. Maitland, Mr. W. R. Plowes, Mrs. W. N. Shaw, Mr. W. F. S. Wilkinson.

METEOROLOGICAL NEWS AND NOTES.

MR. CARLE SALTER gave a popular Lecture on "Rain" at the Technical College, Colchester, on April 23rd.

AN AEROLOGICAL OBSERVATORY has been established at Agra, India, for upper air research under the direction of Mr. J. H. Field, Imperial Meteorologist.

"BRITISH RAINFALL, 1913," is now in an advanced stage of preparation, and it would greatly facilitate the work if any Observers who have not yet sent returns of rainfall for last year would do so shortly.

DR. JULIUS HANN'S well-known *Lehrbuch Der Meteorologie* is being re-issued in parts, of which three have already appeared. No pains have been spared to render this new edition thoroughly up-to-date, a special feature being the copious foot-notes to works of reference.

AN INSTITUTE OF OCEANOGRAPHY is to be established at Havre, at a cost of about £33,000. Plans for a handsome building about 275 feet long and 40 wide have been drawn up by a prominent Paris architect. It is hoped to have the building completed in time for the meetings of the Scientific Congress to be held at Havre in the autumn.

THE METEOROLOGICAL OFFICE, since May 1st, has adopted the new system of barometric readings which are now given in the Daily Weather Map in millibars. Isobars are drawn for intervals of 5 millibars (0·15 in.) as against the 0·10 in. formerly employed. Measurements of rainfall at the telegraphic reporting stations of the Meteorological Office are now printed in millimetres, and references to the velocity of the wind in the remarks column are quoted in metres per second, instead of miles per hour as formerly. The temperature values continue to be given in degrees Fahrenheit.

THE METEOROLOGICAL CONFERENCE which will meet in Edinburgh on Tuesday, September 8th, 1914, and the four following days, to which reference was made in our March number, promises to be one of great interest and importance. Special attention will be given to the teaching of meteorology in schools, and to the relation of meteorology to aviation. There will be an exhibition of historical and modern instruments. The subscription for members of the Conference has been fixed at 10s., whilst ladies accompanying members will be admitted on payment of 5s. Tickets, price 5s., will be issued to matriculated students of any University. Those desirous of attending the Conference or who may wish further information are requested to communicate with the Hon. Secretary of the Committee, Mr. F. J. W. Whipple, M.A., at the Meteorological Office, South Kensington, London, S.W.

THAMES VALLEY RAINFALL. —— APRIL, 1914.

ALTITUDE SCALE
Below 250 feet
250 to 500 feet
500 to 1000 feet
Above 1000 feet.
SCALE OF MILES
Less than one inch.
1in.
1·0in.
1·5in.
2in.
Less than 1·5in.
WARWICK
NORTHAMPTON
CAMBRIDGE
SUFFOLK
WORCESTER
BEDFORD
GLOUCESTER
OXFORD
BUCKINGHAM
HERTFORD
ESSEX
MIDDLESEX
LONDON
BERKSHIRE
WILTSHIRE
HAMPSHIRE
SURREY
KENT
SUSSEX
COTSWOLD HILLS
CHILTERN HILLS
WHITE HORSE HILLS
SALISBURY PLAIN
FOREST RIDGES
RIVER THAMES
Stratford on Avon
Towcester
Bedford
Cambridge
Newmarket
Bury St Edmunds
Worcester
Evesham
Tewkesbury
Cheltenham
Gloucester
Stroud
Cirencester
Malmesbury
Swindon
Wootton Bassett
Chippenham
Calne
Marlborough
Devizes
Trowbridge
Warminster
Salisbury
Tisbury
Stockbridge
Andover
Basingstoke
Winchester
Alton
Petersfield
Haslemere
Farnham
Guildford
Woking
Epsom
Dorking
Reigate
Croydon
Sevenoaks
Maidstone
Ashford
Tenterden
Tunbridge Wells
E. Grinstead
Horsham
Chichester
Hastings
Rye
Banbury
Buckingham
Aylesbury
Winslow
Bicester
Woodstock
Witney
Oxford
Abingdon
Faringdon
Wantage
Lambourn
Hungerford
Newbury
Reading
Wokingham
Basingstoke
Kingsclere
Pewsey
Wellington College
Henley
Wallingford
Thame
Watlington
High Wycombe
Slough
Windsor
Staines
Teddington
Ealing
Harrow
Hendon
Hampstead
Camden Square
Greenwich
Woolwich
Romford
Dartford
Gravesend
Chatham
Sheerness
Southend
Wickford
Brentwood
Chelmsford
Maldon
Colchester
Great Dunmow
Saffron Walden
Newport
Haverhill
Sudbury
Halstead
Bishops Stortford
Hertford
Watford
Potters Bar
Enfield
Epping
Ongar
Loughton
Hatfield
Hitchin
Baldock
Royston
Shelford
Ampthill
Woburn
Biggleswade
Sharnbrook
St Neots
Northampton
Daventry
Warwick
Stratford on Avon
Farnborough
Banbury
Shipston on Stour
Stow on the Wold
Moreton in Marsh
Bourton on the Water
Northleach
Burford
Witney
Woodstock
Bicester
Winslow
Buckingham
Aylesbury
Tring
Berkhamsted
St Albans
Hemel Hempstead
Luton
Dunstable
Bedford
Rivers Avon
Rivers Thames
Rivers Kennet
Rivers Lee
Rivers Colne
Rivers Chelmer
Rivers Medway
Rivers Wey
Rivers Mole
Rivers Ouse
Rivers Nen
Rivers Cam
Rivers Windrush
Rivers Evenlode
Rivers Cherwell
Rivers Leach
Rivers Ock
Rivers Loddon
Rivers Blackwater
Rivers Stour
Rivers Arun
Rivers Adur
Rivers Rother
Rivers Darent
Rivers Cray
Rivers Ravensbourne
Rivers Wandle
Rivers Brent
Rivers Lea
Rivers Roding
Rivers Crouch
Rivers Blackwater
Rivers Stour
Rivers Orwell
Rivers Deben
Rivers Alde
Rivers Ore
Rivers Rother
Rivers Arun
Rivers Adur
Rivers Ouse
Rivers Cuckmere
Rivers Pevensey Levels
Rivers Brede
Rivers Tillingham
Rivers Rother
Rivers Stour
Rivers Great Ouse
Rivers Little Ouse
Rivers Waveney
Rivers Yare
Rivers Bure
Rivers Wensum
Rivers Nar
Rivers Wissey
Rivers Ouse

THE WEATHER OF APRIL.

THE characteristic features of the weather of April were a very high mean temperature, great excess of sunshine, and a marked deficiency of rainfall. Taking the kingdom as a whole the mean temperature was 3·7° above the normal, the excess varying from 4·7° in the north-east of England and about 4·0° in the east of Scotland and midland counties of England, to 3·1° in the south of Ireland. As compared with the normal the warmth was very evenly distributed over the country. Owing to the radiation weather that prevailed during the greater part of the month frost was very common especially in inland districts. During the first ten days of the month conditions were in general unsettled with frequent heavy falls of rain and gales from the west and south-west in many parts. Until the 4th the low pressure systems were central to the west of Ireland, but later the core of the cyclonic disturbance was located off the north of Scotland the area of high pressure being in the vicinity of the Azores. Thunderstorms or thunder only, accompanied in many cases by hail, occurred almost daily from the 1st to the 9th in some parts of the United Kingdom being most frequent in Scotland and the north of England. The heaviest rains were in general reported from the 4th to the 6th. Falls exceeding an inch and a half in the 24 hours were uncommon, none being noted on the 4th. On the 5th Bendamph measured 1·58 in. and Glencarron 1.51 in., and on the 6th Lock Stack reported 2.46 in., Ballachulish House 1·59 in., and Glencarron 1·51 in. The month opened with high temperature, 69° being recorded at Cromer and 68° at Norwich on the 1st, but over the whole of Scotland, Ireland, Wales, and the north-western counties of England, the temperature during the first half of the month seldom touched 60°. The lowest temperature noted during this period was 23° on the 9th at Balmoral.

From the 11th until the end of the month remarkably dry, sunny and warm weather prevailed over the greater portion of the British Islands, the drought being most pronounced to the south of a line joining the Tees and Carmarthen where in many localities an absolute drought of three weeks duration was in progress at the end of the month. On the 12th, when the north of the country was under the influence of a deep cyclonic centre near Iceland, the wind rose in some parts of Scotland to the force of a gale with heavy rain in some western localities, 1·99 in. being noted at Glencarron, 1·72 in. at Invergarry and 1·59 in. at Bendamph. At Lough Caragh (Lickeen) Co. Kerry, a "rain spell" of 84 days terminated on April 15th, it having rained every day since January 23rd. After the 14th the practically uninterrupted series of cyclonic disturbances which had prevailed for many weeks came to an end, the Azores anti-cyclone extending its borders towards Ireland, and until the end of the month the anti-cyclonic type of weather was rarely interrupted. High temperatures were observed in the north of Scotland on the

17th when the thermometer rose to 70° at Nairn and to 68° at Fort-Augustus. Remarkable extremes of temperature were noted on the 20th and 21st. On the former day shade maxima of 75° were noted at stations as far apart as Camden Square and Gordon Castle, and on the 21st the temperature rose to 76° at Camden Square and to 75° at Manchester. The minimum temperatures were equally notable, falling on the 19th to 25° at West Linton, on the 20th (night of 19th and 20th) to 28° at Eskdalemuir and 32° at Nottingham, while a frost on grass occurred over a considerable area on the 21st. The daily range of temperature was large, exceeding 30° in many places and reaching 36° at St. Andrews on the 20th. The maximum temperatures on the 20th and 21st at Camden Square were the highest in April since 1901 when a maximum of 76·8° was recorded.

During the last ten days of the month warm dry and sunny weather continued to prevail in most localities. On the 29th a small cyclonic disturbance, which came up the English Channel from the south, occasioned heavy rains in some places, thunder being noted at Tyn-y-waun and a thunderstorm at Coupar Angus, while at Bucknal in Lincolnshire a change of wind to the east was associated with a fall of temperature amounting to 20° in 15 minutes.

The general rainfall of the month expressed as a percentage of the average, was :—England and Wales, 62; Scotland, 106; Ireland, 72; British Isles, 76.

FIRST IMPRESSIONS OF AN INDIAN CLIMATE.

By F. L. Halliwell.

It has often occurred to me to wonder what must be ones first impressions of a tropical climate, and now, after some 40 years in England, I find myself living only some 20° N. of the equator. Having for many years been interested in matters meteorological, I venture to give a few of my more striking impressions, not confining myself strictly to meteorology.

In the first place I should remark that Karachi, where I am located, is a dry and sunny district, with an annual average rainfall of about 10 inches, and days with rain some 6 per annum.

As regards twilight, concerning which it is frequently asserted there is none in tropical countries, I was decidedly surprised, for though daylight wanes much more rapidly here than in England, there is visible twilight for more than an hour after sunset, and increased starlight and moonlight to some extent compensate, though probably the reason for one taking so little notice of the reduction is due to the fact that the average person does not time the duration of twilight, but merely lights a lamp when it becomes otherwise too dark to see, or, if out of reach of artificial light, times his movements

by the moment when it becomes too dark to see rather than with relation to the hour of sunset.

With reference to rainfall, of which 8 inches in 36 hours is the greatest fall I have so far experienced (this of course being exceptional for this district) my suprise was much greater at the effects rather than the actual rate of rainfall, since I have many times in England seen it rain for several hours at a greater apparent rate than here, and could scarcely believe the total would have been so great, though the washing away of roads and railways bore striking testimony to the exceptional nature of the fall. The most amazing effect however took about a week to materialise, being the transformation of this normally sandy and barren district into the semblance of green pastureland, which gave one greatly to wonder where the seeds came from, and whether a desert such as the Sahara would be as quickly covered under similar circumstances, supposing them possible.

Daily temperatures in this part of India during the months of June to September rarely fail to reach 90° and only occasionally fall below 80°, but equipped with suitable dress and a pith helmet one feels much less discomfort than is experienced in England with 80° and 70° respectively as max. and min.

A really hot day, however, of which these parts fortunately endure but few, yields some surprising effects, my record experience being on June 4th, when a shade temperature of 112° and over (max. 117°) was experienced for several hours, accompanied by a strong breeze. The latter had one curious effect similar to that of a biting N.E. wind in England, in that it caused a tingling of nose and ears; and chairs and tables were not only warm, but actually uncomfortably hot to sit upon or touch.

What the relative humidity was, I have no actual means of determining, but late in the day a standard thermometer registered 104° in the shade, and the same thermometer quickly wrapped with wet muslin and exposed in the same position descended to 79° within a few minutes. When exposed to the wind one was quite unconscious of perspiring, though a very brief period of shelter from the wind proved the matter quite beyond any argument.

On first arrival in a place so uniformly fine and sunny I found it amusingly difficult to open a conversation without reference to the state of the weather, which, except when it rains is quite unusual, and it is still rather a novelty to be able to arrange on outdoor expedition weeks ahead without having to take into consideration weather possibilities.

When it does rain, however, there is no lack of experiences to recount, for naturally buildings are erected more with a view to keeping out sun and heat than rain, and the stock of pots and pans, to say nothing of buckets and baths, is often inadequate to meet the exigencies of the case in the shape of leaky spots.

ARTICLES ON WEATHER IN AN OLD "GARDENER'S DICTIONARY."

By A. E. Swinton, B.A.

On turning over the leaves of a book bought at a recent auction sale, entitled a "Gardener's Dictionary," I was much interested in the articles dealing with weather under the headings of "Barometer," "Freezing," "Thunder," "Rain" and "Wind."

The catalogue of the sale gave the date as 1612, but though the title page was gone I soon discovered that this was too early by many years as Halley's name was frequently quoted, and on reading further I found a meteorological table containing observations taken every three hours on June 2nd, 1721. This shows that the book was published at least 110 years later than 1612. The gardeners at Marchmont House, Berwickshire, by whom the book was used, have inscribed their names in it and some of them give dates. The earliest date I have yet discovered being 1760.

I will begin by quoting from the article "Thunder." "Thunder is defin'd by some to be a Noise in the lowest Region of the Air, excited by a sudden kindling of sulphureous Exhalations.

Some also account for it, by supposing two clouds impending over one another; the upper and rarer whereof becoming condens'd by a fresh Accession of the Air, rais'd thither by Warmth from the lower Parts of the Atmosphere, or driven upon it by the Wind, immediately falls forcibly down upon the lower and denser Cloud; by which Fall the Air interposed between the two being compressed, that next the Extremites of the two Clouds is squeez'd out, and leaves Room for the Extremity of the upper Cloud to close tight upon the under; thus a great Quantity of Air is inclos'd which escaping through some winding irregular Vent or Passage, it occasions the Noise we call *Thunder*."

The book points out that this does not give any account of Lightning, and suggests explosion as the cause.

"Sir Isaac Newton says, There are sulphureous Exhalations always ascending into the Air, when the Earth is dry; these they ferment with the nitrous Acids, and sometimes taking Fire, generate into *Thunder*, *Lightnings*, &c."

He says that the air must contain "Exhalations carry'd off from *Sulphur*, *Bitumens*, *volatile Salts*, &c." which are "rais'd higher or lower according to their greater or less Degree of Subtility and Activity, and more copiously spread in this or that Quarter, according to the Direction of the Winds, &c." Explosions in Coal Mines are adduced as evidence, and it is suggested that the "*Summer* Heat, whenever extraordinary, raises up out of the Earth . . . a great Quantity of sulphureous Vapours, which are of such a Nature, as that meeting with the Nitre of the Air they work upon each other, and thereby begin a further Degree of Heat, which gradually increases till at last it arrives at a certain Pitch, and then they fall upon and

work upon one another, producing an actual Fire and Flame, which with wonderful Swiftness fires the whole train, and so produces a Flash and a Noise. Thus Dr. Hook."

The smell of ozone after a thunderstorm was thought to be a smell of burning sulphur and this suggested that thunderstorms were produced by the explosion of "sulphureous Vapours."

"Now that there is in *Lightning* a sulphureous Vapour, is manifest from the sulphureous Smell that attends it, and the sultry Heat in the Air which is commonly a Fore-runner of *Lightning*.

And that there is a nitrous Vapour in it we may reasonably judge, because we do not know of any Body so liable to a sudden and violent Explosion."

As evidence for spontaneous combustion the author says he is told, "that a Mixture of Sulphur and Filings of Steel with the Admission of a little Water . . . . will of itself break into actual fire." This he regards as the cause of the warmth of the Bath and other hot springs, and of volcanic eruptions.

Mr. Le Clerc is next cited, who says :—

"In all aerial Fires there are three Things observable :—

1. That they are lighted without any human Means, and by some invisible Way.
2. That they run about the Air in various Figures.
3. That some of them continues longer than others do ; but yet they all vanish in a short time.

In order to make a Flame or Spark appear, there is nothing more necessary, than that there should be some Particle so whirled about in the Air, as to cast aside all the grosser matter, and play about in the most subtil Part of the Air.

Now, there are some Matters which are apter to be put in motion than others ; such as the Parts of Sulphur, Bitumen, Nitre, &c. . . . it is no difficult matter for one or two of those Particles to be whirl'd about by the Heat of the Air ; and when they are once inflamed, to set Fire to all the rest about them ; as a consequence of which it is observable, that these aerial Fires are common in *Summer* but more rare in *Winter* ; and by how much the *Summer* is hotter the more common such Fires are: And this sufficiently shows, that the Matter of such Fires is raised and inflamed by the Heat of the Air and the Impetuosity of its motion."

Then follow accounts of two chemical experiments for producing an explosion, and a suggestion that the ingredients of the explosive mixtures may be in the air, in a fine state of division. Some definitions of various kinds of "aerial fire" are appended.

"If the Fire begins at one End, and burns gradually, it is called a *Lamp* ; but if a long Exhalation takes Fire at once, it is called a *Dart*. Sometimes these Exhalations are hurried one way or the other by the Stream of the Air, while they are in Flame, sometimes they continue in the same place, and then they are called *Beams* ; at other times the Clouds part, and the Sky seems to retire, which

may be caus'd by the Wind, and a Flame will flash out at this Opening; when this happens it is call'd a *Chasm*.

When burning Exhalations have less Sulphur in them (which yields a paler Flame) than Nitre, Bitumen, or Tartar, they appear as red as Blood. . . . .

Those which are commonly called *Shooting Stars* are but small Exhalations in our Air, and therefore are not properly *Stars*.

Ignis Fatui [*Jack-in-a-Lanthorn*, *Will-in-a-Whisp*, &c.] seem to consist of a more greasy Exhalation."

There is no attempt to explain the connection between rain and a thunderstorm beyond the following brief paragraph.

"Rain generally attends *Thunder* and *Lightning*, either at the same Time or soon after; and it frequently rains faster after a Clap of *Thunder*. So that Rain seems to be the effect of *Thunder*."

It will be noticed that there is no reference to *Electricity* as the cause of thunderstorms. This explanation was suggested to various experimenters early in the 18th century, by the similarity of Leyden jar sparks to lightning. The definite proof of drawing electricity from thunderclouds by a pointed rod on a tower, was proposed by Benjamin Franklin in 1749. In the actual performance of the experiment however he was forestalled by Dalibard, who in 1752 set up an iron rod 40 feet high at Mary la Ville in France, and succeeded in drawing sparks from a passing cloud.

This furnishes further evidence for the date of the Dictionary, which may be fairly assigned to the second quarter of the 18th century. Since writing the remarks at the beginning of this article it has been pointed out to me that the book contains a reference to the year 1726.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

LARGE IONS IN THE ATMOSPHERE.

A COMMUNICATION from Mr. Gendle in a recent number of your Magazine calls for some comment. Mr. Gendle in the first place makes two statements, neither of which, considered in the light of recent experiments, can be accepted as correct.

The first of these is to the effect that during moderate rain there are more large ions present in the atmosphere than during heavy rain. Experiment shows the very opposite to be the case. Moreover, the number of large ions has been measured on several occasions during transition from light to heavy rain, and *vice versa*; the ionisation increasing to several times its original value as the rain became heavier, and decreasing as it became lighter. I think I am right in saying that on all occasions when the large ions have been

measured during very heavy rain the number present has been far in excess of that found on any occasion during ordinary rain, which I take to be what Mr. Gendle means by moderate rain.

The second statement put forward in this communication is that more large ions accompany rain than accompany snow. There is not a great deal of evidence on the point with regard to snow, but such as there is cannot be held to justify an assertion in such general terms. During one snowstorm, in which observations were taken, there were more large ions detected than was the case in the heaviest rainstorms investigated, and, generally speaking, the electrical conditions during snow are much the same as during heavy rain.

One would like to know more of the discussions of which Mr. Gendle speaks. In any case the final judgment must be given after reference to experiment, and little weight can be given to any discussion whose results are so little borne out by actual observation.

As the rest of the article is made up of considerations based upon these two erroneous statements any further comment is unnecessary, but one or two remarks towards the end makes one wonder if Mr. Gendle's conception of the nature of an ion is not just about as accurate as the two results of "recent discussions" quoted by him.

C. D. STEWART.

Kew, 31st March, 1914.

THE CLIMATE OF TORQUAY.

I HAVE read Mr. Bonacina's letter in your March number, and beg permission to make a few remarks thereon. Mr. Bonacina always seems (to me) to nurse a personal grudge against the British climate. But let that pass. He is quite wrong, however, in thinking that all England is practically much the same in respect of winter conditions. Between Peterborough and Penzance, for instance, there is a difference in January of about 6° or 7° in the mean temperature; and it is important to notice that this is, in all likelihood, made up chiefly when there is great cold, and not when persistent and far spread mildness prevails, as during February, 1914. As to sea-winds, they are always more or less cold, even in summer, if they blow with force. I do not think that snow on Dartmoor seriously affects the climate of South Devon, except, perhaps, after such blizzards as that of January, 1881. Invalids usually know nothing of climate, and they foolishly suppose that on the coast of Cornwall the sun is always shining, and frost is practically unknown. No part of the British archipelago entirely escapes frost. Even in Scilly 25° or 26° has been registered.

Instead of fuchsias, myrtles and yuccas, which along the S.W. coast are fairly hardy, Mr. Bonacina should have studied the behaviour of *Eucalyptus globulus* (blue gum) and *Acacia dealbata* (one of the "mimosas"). Both these may be termed "vegetable thermometers." If they die of cold it is probable that the temperature has fallen to 20° (more or less). I believe I am right in saying

that at Rome, many years ago, all or most of the blue gums were destroyed by a frost of this severity. The extreme degree of cold is more important in this connection than the mean temperature. As to the mimosas, Mons. Daveau, of Montpellier, assures me that they and the palms have been "completely frozen" this winter, though some may shoot again from the base. He gives the temperature as —16° C. on "close-shaven soil." Great devastation was wrought. At Abbotsbury, Dorset, however, an acacia, about 70 feet high, was "a sheet of yellow" many weeks ago.

It may interest many to know that in the gardens of Logan House, about $7\frac{1}{2}$ miles N.N.W. from the Mull of Galloway, and in 54°44′ and 4°57′, there are *Cordylines* about 18 feet high, and even *Dicksonia antarctica* (tree-ferns). The latter are protected in winter by placing straw round the trunks, but more as a precaution than as an actual necessity. Botanico-meteorology has been much neglected.

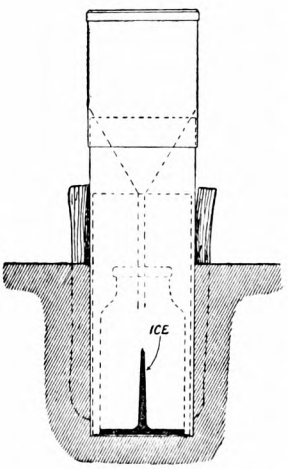
E. G. ALDRIDGE, F.R.Met.Soc.

Barnstaple, 20th March, 1914.

A RAIN GAUGE ICE PILLAR.

This phenomenon was noticed in a 5 in. Snowdon rain gauge situated 2,145 ft. above sea level in the Black Mountains, East Breconshire, on a bleak and windy spot.

On the night of December 29th last, a previous snowfall had drifted a little into the funnel, and the following day was cloudless, very warm in the sun, but very cold in the shade, with a light wind. The max. and min. temperature being 28° and 19°, and about 23° at time of inspection.



The gauge contained an inner cylinder and a bottle forming three air spaces between the ice pillar and the outer cover, while the snow in the funnel was in contact with the metal warmed by the strong sun rays. The gauge was also partly surrounded with wooden pegs to keep it firm, and between which the cold wind could come in contact with the cylinder below the surface.

It is evident that the snow-melting must have been very slow and the drippings very regular, as the pillar was almost the same diameter—like a lead pencil—from top to bottom, from 3 to 4 inches long, but on the bottom was a layer of ice about a quarter of an inch thick, being the effect perhaps of the failure of the cold to freeze all the drippings at the same time. On lifting the bottle out and turning it, the pillar broke at the bottom.

J. R. GETHIN JONES.

VISIBILITY.

MAY I remark that the observations of Mr. H. S. Tabor do not at all coincide with mine? He says that he has always found the greatest number of instances of visibility with north-easterly or easterly winds. I have always found the opposite to be the case; westerly or south-westerly winds being most conducive to visibility, the winds from opposite quarters always producing haziness on the horizon in *any* locality from which I have taken observations.

It is curious your correspondent mentioning stations to the south-west of London, because I took observations at a place in that neighbourhood for many years, and arrived at the same conclusion that he has, that it was the London smoke that made the skies so hazy with north-easterly wind. I was not satisfied, however, and carried out some observations in various places in the country, including Ilfracombe, N. Devon; Worthing, Sussex; and here. All these places being too far away from any large manufacturing town to be affected by its "smokiness," I concluded that my observations would be reliable, and I found the same thing at each place. With a west or south-west wind at Ilfracombe one could frequently see the Welsh coast, and, incidentally, it was nearly always a sign of unsettled weather, whilst a north-east wind would create so much haze that even Lundy Island would sometimes become invisible. At Worthing one could often see the houses on the front at Brighton with a westerly wind, but an easterly wind brought a peculiar haze which veiled the view more or less entirely. Here we have the "Reculvers," at Herne Bay, which are frequently visible in westerly winds and are generally signs of rain. If my memory serves me correctly, I think the Hon. Rollo Russell once investigated this matter and found that the general haziness of the north-easterly wind was due to mixed currents of air, the surface wind blending at a certain altitude with the permanent south-westerly variables.

D. W. HORNER, F.R.Met.Soc.

Westgate-on-Sea.

REVIEWS.

Instituto Central Meteorológico y Geofisico de Chile. Publicaciones bajo la dirección del DR. WALTER KNOCHE. *No. 4, Observaciones Meteor. en la Isla de Pascua, Mayo, 1911—Abril, 1912.* (Meteorological Observations in Easter Island, May, 1911, to April, 1912.) Size $14\frac{1}{2} \times 10\frac{1}{2}$. Pp. viii. + 180, + plates.

THE meteorological station on Easter Island (lat. 27° 10′ S., long. 109° 26′ W.) is located on the south-west part of this South Pacific Patmos, at a height of 98 feet, and close to the coast. The station is one of the first order, and has a very complete installation of the best instruments. The registering apparatus required constant care and attention on the part of the observer, since the air was very humid and full of salt, causing much oxidization of the metallic

parts. Much trouble was also due to the insects who were particu, larly partial to the ink in the pens of the automatic instruments-the supply frequently having to be renewed two or three times a day. The time of the Island was determined by noting the moment when the upper edge of the sun sunk below the sea horizon, the observer being furnished with a table of the hours of sunset throughout the year prepared in the Santiago Observatory. Two subsidiary stations were established in the vicinity of the Observatory of *Mataveri*, at heights of 590 and 1,050 feet.

Tri-daily observations are given in extenso on the usual international form, and hourly values have been tabulated for the principal elements. Cloud amount, species and direction, were noted eight times a day, between the hours of 6 a.m. and 9 p.m. Complete summaries of all the data are given at the end of the general tables, and in a long chapter Dr. Knoche summarises the salient features of the climate. A curious characteristic is that on the mean of the year a relatively large amount of sunshine is associated with a considerable amount of cloud and days with precipitation. Compared with Rome, it is found that whereas Easter Island has 2,443 hours of sunshine in the year, forming 54 per cent. of the possible, the cloud amount there is 6·6 and the days with measurable rain 209, Rome, on the other hand, has 2,394 hours of sunshine (56 per cent. of the possible), with a mean cloud amount of 4·1 and 97 days with rain. In the whole year there were only 12 days without sunshine at Easter Island. The mean annual temperature is 68°·4, the warmest month being February, mean 74°·8, and the coolest October, mean 64°·2, the extremes being 88° and 51°. The total rainfall at the base station was 49·95 in , at 590 feet above the sea 1·30 in. less, but at the height of 1,050 feet the fall increased to 81 in. The maximum fall in one day was 2·95 in. on the 22nd March, which was the wettest month of the year, with 10·60 in. In addition to the chapters on Meteorology, there are others dealing with the botany, geology, geomorfology and seismology, each by well known Chilean experts. The volume as a whole is one of great interest, treating as it does with a remote and little known region.

Climate and Weather of Australia, by H. A. Hunt, Griffith Taylor and E. T. Quayle. Melbourne: Albert T. Mallett, 1913. Size $9\frac{1}{4} \times 6$, pp. 93, maps and charts. Price 5s.

The size of this volume is much less than its importance, because in the 93 pages which it contains is compressed an immense amount of information of the greatest value, not only to the meteorologist but to all interested in the prosperity and expansion of the rapidly increasing agricultural interests of the Australian Commonwealth. A pioneer work of this nature is one that presents immense difficulties in its compilation, and the Authors are in every way to be congratulated on the exceedingly well balanced manner in which the

subject has been treated. There are 41 full page maps comprising 159 figures, in which the climate and weather types of the Continent are graphically delineated. The widely scattered work of Russell, Ellery, and Sir Chas. Todd is incorporated with the recent labours of Mr. Hunt, the Commonwealth Meteorologist, and the whole brought to a focus in the volume before us. Three wireless stations have been established to aid in weather forecasting, but the most southern of these, viz. that on Adélie Land, the site of Dr. Mawson's highly successful Antarctic Expedition, has recently been discontinued.

This volume constitutes a valuable contribution to southern hemisphere meteorology, and is characterised by an easy and lucid style and method of treatment rarely to be found in works of this class.

Meteorological Office. Geophysical Memoirs, No. 5. The International Kite and Balloon Ascents. By ERNEST GOLD, M.A. London: H.M. Stationery Office. To be purchased from the Meteorological Office, Exhibition Road, South Kensington, London, S.W. 1913. Size 12 × 10, pp. 84 + 11 plates. Price 1s. 6d.

AT the twenty-fifth Annual Congress of the German Meteorological Society, held at Hamburg in 1908, a competition on Upper Air problems was announced, and in 1912 Mr. Gold was awarded the first prize for the memoir under consideration, which has now been printed by the Meteorological Office as one of the *Geophysical Memoirs*. In this dissertation the basis of the study is derived almost wholly from the European observations contained in the publications of the International Commission for Scientific Aeronautics during the six years, 1904--1909, but in addition all available sources of information have been utilised, and more than 12,000 individual observations examined. The records from balloons carrying meteorographs have been supplemented by kite observations so as to enable the low level conditions to be studied more completely than would have been otherwise possible. The memoir is divided into two parts which deal with Temperature and Wind. The Temperature data are discussed in great detail; the first section treats of mean temperatures and gradients of temperature, then comes a discussion of the annual and diurnal variation of temperature at different heights and places. An interesting chapter on the stratosphere follows, after which the temperatures under cyclonic and anti-cyclonic conditions are examined. The second part of the work deals with the winds of the upper air as deduced from the drift of registering balloons, by pilot balloons and kite observations. It is quite impossible in a short notice to attempt even to summarise the many valuable conclusions which Mr. Gold has drawn from the great mass of material utilised in this work. The intrinsic importance of the author's upper air researches is well known, and in the comprehensive memoir under notice one is able to appreciate to the full the labour and ingenuity brought to bear on fundamental problems of atmospheric circulation.

RAINFALL TABLE FOR APRIL, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1914.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	1·74	·81
Tenterden	*Kent*	51 4	*0 41	190	1·77	1·26
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·82	2·22
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	1·98	1·42
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·67	·94
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·78	·65
Shoeburyness	*Essex*	51 31	*0 48	13	1·25	·70
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·62	·74
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·55	·63
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·34	2·22
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·39	1·38
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·09	1·46
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·20	1·48
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·96	1·43
Boston	*Lincolnshire*	52 58	0 1	11	1·57	·98
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·62	·70
Macclesfield	*Cheshire*	53 15	2 7	501	2·02	1·50
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	1·84	·85
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·73	2·03
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·85	·92
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·69	·37
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·84	·74
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·91	5·71
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·50	2·89
Haverfordwest	*Pembroke*	51 48	4 58	90	2·82	1·15
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·48	·66
Llandudno	*Carnarvon*	53 20	3 50	72	1·79	·47
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·50	2·11
Marchmont House	*Berwick*	55 44	2 24	498	2·28	·85
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·81	3·23
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	1·86	2·39
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·69	6·67
Mull (Quinish)	,,	56 34	6 13	35	2·98	4·26
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·93	·79
Braemar	*Aberdeen*	57 0	3 24	1114	2·30	1·45
Aberdeen (Cranford)	,,	57 8	2 7	120	2·23	·65
Cawdor	*Nairn*	57 31	3 57	250	1·62	·30
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·22	3·47
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·70	8·70
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·02	1·05
Wick	*Caithness*	58 26	3 6	77	1·89	1·12
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·46	2·51
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·68	1·44
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·54	2·21
Ennistymon House	*Clare*	52 57	9 18	37	2·81	2·03
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·37	1·09
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·54	1·80
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·03	·72
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·37	1·58
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·13	2·88
Cong (The Glebe)	,,	53 33	9 16	112	2·98	2·19
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·52	2·21
Seaforde	*Down*	54 19	5 50	180	2·76	1·77
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·08	1·71
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·50	

RAINFALL TABLE FOR APRIL, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.				Mean Annual 1875–1909.	STATION.
Diff. from Av.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1875–1909.	1914.	Diff. from Aver.	% of Av.		
in.		in.	Date.		in.	in.	in.		in.	
— ·93	47	·19	4, 5	9	6·93	8·24	+1·31	119	25·11	Camden Square
— ·51	71	·41	5	11	7·76	10·84	+3·08	140	27·64	Tenterden
+ ·40	122	·49	30	9	8·53	12·13	+3·60	142	30·48	Patching
— ·56	72	·30	5	11	9·18	11·67	+2·49	127	31·87	Cadland
— ·73	56	·24	4	12	6·52	6·72	+ ·20	103	24·58	Oxford
—1·13	37	·14	4, 5	9	7·05	5·32	—1·73	75	25·17	Croyland Abbey
— ·55	56	·17	5	14	4·96	6·65	+1·69	134	19·28	Shoeburyness
— ·88	46	·21	4	9	6·62	8·80	+2·18	133	25·40	Westley
— ·92	41	·14	5	9	6·06	7·29	+1·23	120	23·73	Geldeston
— ·12	95	·58	10	12	11·62	16·89	+5·27	145	38·27	Polapit Tamar
—1·01	58	·39	9	11	10·13	11·23	+1·10	111	33·54	Rousdon
— ·63	70	·26	5	11	8·55	8·95	+ ·40	105	29·81	Stroud
— ·72	67	·28	5	10	9·07	8·98	— ·09	99	32·41	Wolstaston
— ·53	73	·36	9	10	8·08	6·28	—1·80	78	28·98	Coventry
— ·59	62	·30	4	12	6·11	5·98	— ·13	98	23·35	Boston
— ·92	43	·15	6	9	6·66	4·43	—2·23	66	24·46	Hodsock Priory
— ·52	74	·27	10	12	9·48	10·84	+1·36	114	34·73	Macclesfield
— ·99	46	·41	4	10	8·57	7·70	— ·87	90	32·70	Southport
—1·70	54	·55	4	8	20·04	22·35	+2·31	112	61·49	Arncliffe
— ·93	50	·28	10	6	7·37	6·09	—1·28	83	26·87	Ribston Hall
—1·32	22	·13	4	8	7·01	5·12	—1·89	73	26·42	Hull
—1·10	40	·21	6	10	7·47	6·15	—1·32	82	27·94	Newcastle
—1·20	83	1·13	4	15	41·94	53·09	+11·15	127	129·48	Seathwaite
+ ·39	116	·59	5	12	12·11	15·87	+3·76	131	42·28	Cardiff
—1·67	41	·37	4	10	14·09	14·16	+ ·07	100	46·81	Haverfordwest
—1·82	27	·16	22	13	12·52	15·54	+3·02	124	45·46	Gogerddan
—1·32	26	·12	4	9	8·54	8·30	— ·24	97	30·36	Llandudno
— ·39	85	·41	5	16	13·35	19·05	+5·70	143	43·47	Cargen
—1·43	37	·20	5	11	9·47	8·28	—1·19	87	33·76	Marchmont
+ ·42	115	·79	12	16	15·08	20·66	+5·58	137	49·77	Girvan
+ ·53	129	·57	5	14	10·70	13·42	+2·72	125	35·97	Glasgow
+2·98	181	1·69	12	16	22·15	30·06	+7·91	136	68·67	Inveraray
+1·28	143	1·04	12	15	17·26	20·70	+3·44	120	56·57	Quinish
—1·14	41	·26	9	7	7·91	7·97	+ ·06	101	28·64	Dundee
— ·85	63	·40	10	13	10·64	12·91	+2·27	121	34·93	Braemar
—1·58	29	·11	5, 29	12	9·60	7·86	—1·74	82	32·73	Aberdeen
—1·32	19	·18	23	3	8·31	6·55	—1·76	79	29·33	Cawdor
+1·25	157	·73	12	14	15·79	13·76	—2·03	87	44·53	Fort Augustus
+4·00	185	1·59	12	14	28·94	37·00	+8·06	128	83·93	Bendamph
— ·97	52	·40	23	10	9·99	10·70	+ ·71	107	31·90	Dunrobin Castle
— ·77	59	·25	22	16	8·84	8·64	— ·20	98	29·88	Wick
— ·95	73	.41	8	14	18·90	27·37	+8·47	145	54·81	Killarney
—1·24	54	·41	3	10	12·28	12·82	+ ·54	104	39·57	Waterford
— ·33	87	·53	4	13	12·30	16·39	+4·09	133	39·43	Castle Lough
— ·78	72	·41	4	14	13·79	19·74	+5·95	143	46·52	Ennistymon
—1·28	46	·49	3	8	10·59	11·16	+ ·57	105	34·99	Courtown Ho.
— ·74	71	·42	3	14	10·83	12·48	+1·65	115	35·92	Abbey Leix
—1·31	35	·20	3	11	8·08	6·30	—1·78	78	27·68	Dublin
— ·79	67	·38	12	12	10·78	11·88	+1·10	110	36·15	Mullingar.
— ·25	92	·37	4	15	17·04	21·94	+4·90	129	52·87	Enniscoe
— ·79	73	·41	4	14	15·29	21·07	+5·78	138	48·90	Cong
— ·31	88	·45	3	14	12·92	16·68	+3·76	129	42·71	Markree
— ·99	64	·56	4	12	11·82	11·98	+ ·16	101	38·91	Seaforde
— ·37	82	·25	7	16	10·56	12·80	+2·24	121	37·56	Dundarave
— ·16	94	·40	5, 6	16	11·62	15·73	+4·11	135	39·38	Omagh

SUPPLEMENTARY RAINFALL, APRIL, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	1·28	XI.	Lligwy	·68
,,	Ramsgate.....	1·18	,,	Douglas	·94
,,	Hailsham	1·41	XII.	Stoneykirk, Ardwell House...	1·92
,,	Totland Bay, Aston House...	1·00	,,	Dalry, The Old Garroch.....	3·81
,,	Stockbridge, Ashley..	1·31	,,	Beattock, Kinnelhead	4·34
,,	Grayshott.....	1·74	,,	Langholm, Drove Road	2·46
III.	Harrow Weald, Hill House...	·76	XIII.	Meggat Water, Cramilt Lodge	2·81
,,	Caversham, Rectory Road ...	·85	,,	North Berwick Reservoir.....	...
,,	Pitsford, Sedgebrook.....	·65	,,	Edinburgh, Royal Observaty.	1·29
,,	Woburn, Milton Bryant.....	·92	XIV.	Maybole, Knockdon Farm ...	3·74
,,	Chatteris, The Priory..... ...	·47	XV.	Ballachulish House	7·24
IV.	Elsenham, Gaunts End	·83	,,	Campbeltown, Witchburn ..	3·32
,,	Colchester, Hill Ho., Lexden	·89	,,	Holy Loch, Ardnadam.....	5·34
,,	Ipswich, Rookwood,Copdock	·85	,,	Islay, Eallabus	2·85
,,	Blakeney..... . ..	·49	,,	Tiree, Cornaigmore	3·00
,,	Swaffham	·67	XVI.	Dollar Academy	1·90
V.	Bishops Cannings	1·56	,,	Balquhidder, Stronvar.....	6·15
,,	Wimborne, St. John's Hill ...	1·21	,,	Glenlyon, Meggernie Castle..	6·42
,,	Ashburton, Druid House.. ...	2·55	,,	Blair Atholl	2·23
,,	Cullompton	1·77	,,	Coupar Angus	·86
,,	Lynmouth, Rock House	2·70	,,	Montrose, Sunnyside Asylum.	·50
,,	Okehampton, Oaklands... ...	2·37	XVII.	Alford, Lynturk Manse	·59
,,	Hartland Abbey.....	1·76	,,	Fyvie Castle	·27
,,	Probus, Lamellyn.....	2·32	,,	Keith Station	·68
,,	North Cadbury Rectory.....	1·17	XVIII.	Rothiemurchus	1·23
VI.	Clifton, Pembroke Road.....	1·76	,,	Loch Quoich, Loan	19·65
,,	Ross, The Graig	1·53	,,	Drumnadrochit..... ..	1·80
,,	Shifnal, Hatton Grange.....	·92	,,	Skye, Dunvegan	6·86
,,	Droitwich.....	1·14	,,	Lochmaddy Bayhead	4·00
,,	Blockley, Upton Wold.....	1·27	,,	Glencarron Lodge	8·83
VII.	Market Overton.....	1·47	XIX.	Invershin	1·68
,,	Market Rasen	·85	,,	Melvich	1·57
,,	Bawtry, Hesley Hall	·67	,,	Loch Stack, Ardchullin	6·88
,,	Derby, Midland Railway.....	·78	XX.	Skibbereen Rectory	2·39
,,	Buxton	1·53	,,	Dunmanway, The Rectory ..	3·05
VIII.	Nantwich, Dorfold Hall	1·01	,,	Glanmire, Lota Lodge, No. 1	1·49
,,	Chatburn, Middlewood	1·15	,,	Mitchelstown Castle.....	1·25
,,	Cartmel, Flookburgh	·79	,,	Darrynane Abbey.....	2·26
IX.	Langsett Moor, Up. Midhope	1·40	,,	Clonmel, Bruce Villa	1·48
,,	Scarborough, Scalby	·89	,,	Newmarket-on-Fergus,Fenloe	1·85
,,	Ingleby Greenhow	·88	XXI.	Laragh, Glendalough	4·72
,,	Mickleton	1·80	,,	Ballycumber, Moorock Lodge	2·38
X.	Bellingham, High Green Manor	1·14	,,	Balbriggan, Ardgillan	1·33
,,	Ilderton, Lilburn Cottage ...	·66	XXII.	Woodlawn	2·04
,,	Keswick, The Bank.....	2·44	,,	Westport, St. Helens	3·35
XI.	Llanfrechfa Grange	2·57	,,	Dugort, Slievemore Hotel ...	3·97
,,	Treherbert, Tyn-y-waun	3·64	,,	Mohill Rectory	2·38
,,	Carmarthen, The Friary	1·53	XXIII.	Enniskillen, Portora.....	2·23
,,	Castle Malgwyn [Llechryd]...	1·11	,,	Dartrey [Cootehill]	1·78
,,	Crickhowell, Tal-y-maes.....	1·90	,,	Warrenpoint, Manor House ..	1·89
,,	New Radnor, Ednol	3·00	,,	Banbridge, Milltown	...
,,	Birmingham WW., Tyrmynydd	3·07	,,	Belfast, Cave Hill Road	1·61
,,	Lake Vyrnwy	...	,,	Glenarm Castle..... ...	2·63
,,	Llangyhanfal, Plâs Draw.....	·79	,,	Londonderry, Creggan Res...	2·06
,,	Dolgelly, Bryntirion.....	1·42	,,	Dunfanaghy, Horn Head ...	2·90
,,	Bettws-y-Coed, Tyn-y-bryn...	1·97	,,	Killybegs	2·82

METEOROLOGICAL NOTES ON APRIL, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Fair or fine with occasional showers in the first 10 days, after which the month was brilliantly sunny, dry, and warm. Mean temp. 51°·8 or 3°·7 above the average. Duration of sunshine 211·8* hours, and of R 19·6 hours. Evaporation 1·84 in. Shade max. 76°·2 on 21st, the highest temp. recorded in April since 23rd April, 1901, when 76°·8 was registered; min. 34°·4 on 26th. F 0, f 7.

TENTERDEN.—Wet until 11th, then very dry and wind mostly E. Duration of sunshine 248† hours. Shade max. 72°·5 on 21st; min. 35°·0 on 26th. F 0, f 9.

TOTLAND BAY.—Duration of sunshine 234·6* hours, or 52·8 hours above the average. An absolute drought of 18 days from 11th to 28th. Shade max. 70°·1 on 29th; min. 34°·4 on 26th. F 0, f 2.

PITSFORD.—R 1·21 in. below the average. Mean temp. 49°·0. Shade max. 74°5 on 21st; min. 28°6 on 16th. F 5.

IPSWICH, COPDOCK.—After a rather dull opening, sunny weather set in on 12th and continued with a short break, from 22nd to 24th, until 30th, which proved completely sunless. Mean temp. 48°·8. Duration of sunshine 231·6* hours, and of R 14·7 hours. Shade max. 71°·0 on 21st; min. 31°·0 on 26th. F 2, f 16.

POLAPIT TAMAR.—Generally high day and low night temp. Practically the whole R fell in the first 10 days Shade max. 73°·0 on 29th, the highest recorded for April in the last 20 years; min. 30°·9 on 15th. F 1, f 6.

NORTH CADBURY.—Wet and stormy, but not without fine weather to 10th, after which no measurable R fell. Practically cloudless from 14th to 29th, except on 23rd—25th. The warmest and least cloudy April in 18 years. Shade max. 78°·0 on 29th; min. 32°·5 on 8th. F 0, f 14.

HODSOCK PRIORY.—Duration of sunshine 215·5* hours, which is the best in April since 1893. It is also necessary to go back to the same month for one with warmer days. Shade max. 73°·7 on 22nd; min. 28°·1 on 17th. F 6, f 17.

SOUTHPORT.—Duration of sunshine 212·9* hours, and of R 14·6 hours. Mean temp. 49°·0 or 3°·5 above the average, Evaporation 2·03 in. Shade max. 69°·0 on 19th; min. 32°·0 on 16th. F 1, f 12.

HULL.—Only 3 dull days and nearly all cloudless, bright nights. Duration of sunshine 177* hours. Shade max. 75°·0 on 22nd; min. 30°·0 on 17th. F 1, f 12.

HAVERFORDWEST.—Duration of sunshine 261·6* hours. Shade max. 69°·1 on 20th and 21st; min. 32°·8 on 12th.

BETTWS-Y-COED.—Mild and wet in the first 10 days, but dry, bright and sunny after. Cold E. winds.

MARCHMONT.—Duration of sunshine 235·3 hours on 29 days. Shade max. 74° on 28th; min. 30° on 9th and 15th. F 3, f 12.

HOLY LOCH, ARDNADAM.—The first half was wet, dull and cold, the last half dry and warm with slight haze. Shade max. 69°·7 on 21st; min. 33°·1 on 16th. F 0, f 13.

DRUMNADROCHIT.—R ·24 in. and rain days 3 below the average of 28 years. An excellent seed time from 15th.

LOCH STACK.—Duration of sunshine 130·8* hours.

WATERFORD.—Mean temp. 50°·0. No R after 13th. Shade max. 69°5 on 21st.

NEWMARKET-ON-FERGUS.—R registered every day from 24th January to 13th April, 80 days.

DUBLIN.—Changeable, showery and windy till 13th, then fine, bright and dry with a large diurnal range of temp. on several occasions Mean temp. 50°·0 or 2°·7 above the average. Shade max. 68°·0 on 21st; min. 36°·9 on 16th. F 0, f 0.

KILLYBEGS.—A fine month and the latter half warm and sunny.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, November, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	59°9	11	29°8	23	54°3	41°3	44°5	89	90°7	27°7	2·35	17	7·7
Malta	75·2	1*	55·0	28, 30	69·8	62·1	54·0	71	141·0	..	1·39	6	9·6
Lagos	99·3	24	72·2	3, 5	90·1	75·1	74·1	73	152·2	70·0	·61	3	5·1
Cape Town	91·3	19	45·4	12	74·2	57·3	54·2	66	...	...	1·75	10	4·9
Natal, Durban ...	78·0	20	59·0	28	72·8	65·3	65·7	80	...	...	4·15	15	7·0
Johannesburg	83·8	18	47·0	14	75·8	54·2	48·1	62	152·1	46·5	4·07	10	4·1
Mauritius	87·4	27	64·1	12	83·8	66·3	63·4	69	155·5	48·9	·83	6	4·6
Bloemfontein	90·2	18	43·9	26	82·0	55·1	46·8	47	...	...	·91	6	3·3
Calcutta...	85·6	7	58·1	26	80·8	63·4	61·8	72	...	51·7	·54	2	2·8
Bombay...	90·2	1	70·1	14	86·9	73·1	68·7	70	138·9	60·9	...	...	1·2
Madras	87·6	21	67·3	15	84·0	73·4	71·2	81	137·4	63·4	17·99	12	6·2
Colombo, Ceylon ...	90·5	26	70·1	17	85·9	73·1	73·0	82	159·9	63·8	11·50	16	6·7
Hongkong	82·1	7	52·0	15	74·0	66·0	61·0	72	...	...	·74	4	5·6
Sydney	89·4	21	48·1	5	75·4	59·1	47·2	44	144·3	40·2	·80	6	3·9
Melbourne	89·1	29	41·0	4	68·6	49·3	45·7	59	148·5	36·5	1·70	17	6·3
Adelaide	97·9	30	42·9	6	75·6	54·7	49·9	53	157·5	39·0	1·36	11	4·8
Perth	104·6	24	44·9	8	74·8	55·4	52·9	64	164·5	40·0	·85	9	4·5
Coolgardie	106·2	25	48·8	9	88·3	58·0	46·4	34	169·2	45·2	·14	3	2·6
Hobart, Tasmania ...	75·9	29	35·2	5	61·2	45·9	41·5	60	143·2	30·2	3·67	18	6·9
Wellington	71·8	11	41·6	13	63·6	51·2	49·5	75	142·0	34·6	4·15	18	7·6
Auckland	72·0	24	47·0	13	66·1	54·0	52·7	77	145·0	44·0	6·16	22	6·1
Jamaica, Kingston ...	90·2	4	68·2	30	88·1	71·2	70·4	82	...	...	1·68	6	6·0
Grenada	87·0	3	70·0	25	83·9	74·2	...	76	137·0	...	10·39	20	4·5
Toronto	63·6	23	27·0	11	48·8	35·7	34·9	80	105·3	25·3	3·84	13	...
Fredericton	62·0	10	4·0	28	44·4	27·2	...	82	...	...	1·45	6	5·0
St. John, N.B. ...	61·8	9	12·0	28	45·8	33·3	32·0	75	...	...	1·37	6	6·0
Edmonton, Alberta ...	55·9	3	6·4	22	38·4	20·0	...	75	100·0	0·0	·05	3	5·9
Victoria, B.C.	55·8	3	31·3	21	48·8	39·3	41·0	88	...	...	4·70	17	7·0

* 12 and 14.

Johannesburg.—Bright sunshine 271·8 hours.

Mauritius.—Mean temp. of air 0°·5 below, dew point 0°·8 below, and R ·91 in. below, averages. Mean hourly velocity of wind 10·3 miles, or 0·4 below average.

Bloemfontein.—Extremely dry with wind and dust nearly every day.

COLOMBO.—Mean temp. of air 79°·5, or 0°·1 below, of dew point 0°·2 below, and R 1·66 in. above, averages. Mean velocity of wind 4·0 miles per hour. TSS on seven days.

HONGKONG.—Mean temp. of air 70°·0. Mean hourly velocity of wind 12·5 miles. Bright sunshine 171·3 hours.

Melbourne.—Mean temp. of air 2°·3 below, and R ·50 in. below, averages.

Adelaide.—Mean temp. of air 1°·9 above, and R ·21 in. above, averages.

Perth.—Max. temp. for November a record. Temp. of air normal, and R above average.

Coolgardie.—Temp. of air 2°·3 above, and R ·4 in. below, averages.

Hobart.—Temp. of air 4° below, and R 1·17 in. above, averages.

Wellington.—Mean temp. of air 0°·6 above, and R ·77 in. above, averages. Bright sunshine 188·9 hours.

Auckland.—A stormy month, R nearly twice the average.

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FLOODS IN THE ARGENTINE REPUBLIC.

Heavy rains, accompanied by much flooding, occurred very generally throughout almost the whole of the Argentine Republic between the 21st and 27th of April, in which period from 8 to 14 inches of rain fell, according to locality, in the northern section of the country. These amounts are quite unprecedented for the season of the year over a long term of years. The heaviest downfalls occurred in the provinces of Santa Fe and Entre Rios. We have not yet seen the Argentine Daily Weather Maps for the above period, but from *La Nacion* for April 25th, which devotes over eight columns to the storm then in progress, we note that in the twenty-four hours ending 8 a.m. on the 24th, considerably more than 5 inches of rain fell over a wide area. The maximum daily falls reported were 9·10 in. at Mansilla and 8·66 in. at Atreucó in Entre Rios, and 8·54 in. at Helvecia in Santa Fe. The cyclone seems to have reached its greatest intensity over the maize belts in the province of Entre Rios where seventeen of the thirty-nine reporting stations measured more than 6 inches of rain in the 24 hours referred to. In the vicinity of the Capital, the maximum fall seems to have been about 5·50 in. Previous inundations in the vicinity of the city of Buenos Aires having shown the desirability of canals to run off the surplus water in the inundable zone during times of flood, it is to be noted with concern that there is a general outcry that the canals have done more harm than good. It is undoubtedly a fact that, however much these canals serve as auxiliary collectors to run off the surface water in times of excessive rainfall for the total area taken as one unit, their construction, with their natural banks, has intercepted the natural depressions through whose courses the surface waters hitherto found an exit.

Previous floods in the province of Buenos Aires occurred in 1845, 1857, 1877, September 1884, January 1889, March 1895, August 1899, March 1900, and April and May 1911, those of 1884, 1900 and 1911 being locally of much the same intensity as the recent visitation. We do not think, however, that the Argentine records show anything approaching such a wide-spread rainstorm as that of April, 1914. Owing to the impassable state of the roads it has been found impossible to bring the maize crop to the railway stations in

many instances, with the result that an enormous deficit as compared with last year is already apparent in the receipts of the various railway companies. Heavy rains are also reported as having taken place during the first half of May, which still further increases the difficulties of road transit.

PROPOSED SCOTTISH OCEANOGRAPHICAL INSTITUTE.

A National Oceanographical Institute in Scotland is proposed as a memorial to the late Sir John Murray. At a largely attended meeting held in the rooms of the Royal Society of Edinburgh, on May 25th, Lord Strathclyde in the chair, Professor Geikie moved, "That a permanent foundation of an Oceanographical Institute in the capital of Scotland is highly desirable." Professor Geikie said it seemed obvious that the prestige of Britain in oceanographical science should be maintained, and there were very special reasons why Scotland in particular should be interested in this matter, for at the present time the only laboratories in these islands that dealt with world-wide oceanographical problems were the two laboratories established by their late lamented friend, Sir John Murray, and Dr. W. S. Bruce.

It was pointed out that Sir John Murray's laboratory was established in 1876, on his return from the *Challenger* Expedition, while Dr. Bruce's was begun 21 years later. In the *Challenger* office was housed the finest collection of deep sea deposits in the world; while Dr. Bruce's laboratory was specially rich in polar marine fauna, notably in abyssmal forms.

Professor Sir Edward Schäfer, who seconded, said there could be no doubt Sir John Murray, were he with them that day, would have been the first to join in welcoming the establishment of such an institute upon a firm and permanent basis, and indeed, it was a well-known fact that it was his intention to take steps with the view of making some permanent foundation such as was now proposed, and for which they had already such a splendid nucleus available.

Dr. John Horne said that one of the main objects of the scheme was to have within the city of Edinburgh a permanent memorial to the services rendered by the late Sir John Murray to the science of oceanography. Sir John Murray was the recognised leader of that branch of science in his life-time, and he left behind him a collection of deep-sea deposits that were without rival in the world. He believed that a further purpose was to establish a lectureship in oceanography within the University, and to affiliate the combined collections of Sir John Murray and Dr. Bruce with the University.

Lord Strathclyde moved :—"That a Committee be formed for the purpose of considering how such an institution may best be organised, with power to issue an appeal for funds."

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday afternoon, May 20th, at 70, Victoria Street, Westminster, Mr. C. J. P. Cave, M.A., President, in the chair.

Mr. E. Gold read a paper on "The Reduction of Barometer Readings in Absolute Units, and a New Form of Barometer Card."*

Mr. A. Hampton Brown also read a paper on "A Cuban Rain Record and its Application," in which he dealt with the rainfall records of the Belen College Observatory, Havana, for the period 1859 to 1912, and gave particulars of the monthly, yearly, and seasonal rainfall. The mean annual rainfall is 49·96 in.; that of 1867, the wettest year, 71·40 in., and of 1899, the driest year, 27·90 in. The driest month on the average is March with a rainfall of 1·91 in. closely followed by February and April with rainfalls of 2·16 and 2·23 in. respectively. The wettest months are October 6·92 in., and June 6·71 in. The dry season is from November to April with a downfall of 14·6 in. or 29 per cent. of the annual total. The wet season is from May to October with 35·4 in.

The monthly totals exhibit large variations at all times of the year. The most phenomenal month was April 1869, when 22·57 in. fell on 6 days. In only one other April has the total exceeded 8 in., and in 1896 no measurable rain was recorded in that month. October, the wettest month of the year, shows the least variation from its normal fall.

Droughts are frequent and often of severe character when considered with the high temperature, bright sunshine, and low humidity. On three occasions in the fifty years rainless months occurred.

In the second portion of this paper the Author has made an endeavour to apply or connect the information contained in the data, in order to trace, if possible, its bearing on the meteorological conditions of some other part of the world.

He found from a comparison of the Havana rain data since 1878 for the wet season (May to October) with the precipitation in England South-West, and South Wales during the three months January to March following, that an excess rainfall in Havana during May to October was generally succeeded by a deficient rainfall in England, S.W., at the beginning of the next year, and *vice versâ*.

For the eight years 1888 to 1895, when the percentage at Havana was continuously in excess, in England S.W. the figures with one exception were the reverse. Again, during the next five years, 1896-1900, there was a deficiency at the Cuban station, and, excepting 1897, excess in England. There are several years where the application fails, but the general continuance of the see-saw movement is so remarkable that it can hardly be regarded as a coincidence, since the correlation co-efficient gives r equal to—·54 with a probable error of ·08.

* See special article on p. 85.

Possibly the secret of the connection between the two spheres of observation lies hidden within the interaction of currents, but the data for the detailed examination of the winds, currents, and temperature of the Atlantic are not easily obtainable, and must be left to those who have more access to the material required.

Mr. F. J. W. Whipple read some notes by Capt. Campbell Hepworth who had found that it took 25 days for water to travel from the Gulf of Mexico to our shores. Capt. Hepworth showed that the Gulf Stream, the Atlantic sea-surface temperatures and the surface currents had a marked influence on the climate of the British Isles.

Col. H. E. Rawson referred to researches of Dr. W. N. Shaw, Mr. W. H. Dines and others, in establishing a connection between the weather records at St. Helena and the weather in the south of England.

Mr. A. P. Jenkin and the President also spoke.

Dr. Hans Pettersson exhibited and gave an account of an ingenious current-meter invented by his father Professor Otto Pettersson of Stockholm, the eminent Swedish oceanographer.

The following gentlemen were elected Fellows of the Society:—Mr. A. H. R. Goldie, M.A., B.A., Capt. J. B. R. Haines, Mr. P. J. O'Gara, B.Sc., Mr. T. L. Patterson, M.A., Mr. H. D. Roger, L.L.B., Mr. J. G. Rodger, Ph.D., B.A., B.D., Mr. D. M. Turner, M.R.S.I.

METEOROLOGICAL NEWS AND NOTES.

Dr. H. R. Mill has returned to England from a voyage round the World, including a stay of some months in New Zealand. We are glad to learn that his health has considerably improved during the long rest.

Dr. W. S. Bruce has been awarded the Neill Prize by the Royal Society of Edinburgh in recognition of the scientific results of his Arctic and Antarctic explorations.

Commander W. F. Caborne, C.B., F.R.Met.Soc., has been appointed one of the two nautical assessors in connection with the inquiry to be held by the British Commission into the loss of the C.P.R. liner *Empress of Ireland*, and left with the other members of the party by the Cunard steamer *Mauretania* on the 6th inst.

Sir John W. Moore, M.D., delivered a lecture before the Royal Societies' Club, on May 27th, the subject being "Weather Study in 1914," illustrated by numerous lantern slides. Mr. E. B. Knobel, Past President of the Royal Astronomical Society occupied the chair, and there was a good attendance. A discussion followed in which Dr. W. N. Shaw, among others, took part.

Mr. H. Norman Edge has been recently appointed Honorary Lecturer on Meteorology to the Lancashire (Navy League) and National Sea Training Homes, Liscard, Cheshire.

THE CORRECTION AND REDUCTION OF BAROMETER READINGS.*

By E. GOLD, M.A.

THE decision of the Meteorological Committee to use absolute units for the values of pressure published in the Daily Weather Report made it necessary to consider the question of the reduction of barometer readings in these units.

When a mercury barometer is used for measuring atmospheric pressure, the readings taken at different times are only comparable if a correction is made to allow for the difference between the temperature of the instrument at the time of observation and some standard temperature. The values at different places are comparable only if further corrections are made on account of the variation of gravity and of the effect of the altitude upon the pressure.

The three corrections may be applied separately, but in many cases the correction for gravity is incorporated with the correction for altitude in one table. This is easily done, because both corrections are proportional to the height of the barometer, and the gravity correction does not vary in any other way at a fixed station. The correction for the temperature of the instrument is also proportional to the pressure, but it is not possible to incorporate this in the same table as it varies with the temperature, while the altitude correction varies with the temperature of the outside air. The different corrections can, however, all be incorporated in one table of double entry. Such a table was given by Mr. Marriott in the *Quar.Jour. Roy.Met.Soc.* for 1875. That table was made on the principle that the effect of an increase of pressure upon the final correction could be just counter-balanced by an appropriate increase in the temperature of the air. A similar table could be prepared on the principle that an increase in the temperature of the air can be just counter-balanced by an increase in the value taken for the temperature of the instrument, and this principle has been utilized in preparing the new cards for use at stations of the Meteorological Office.

Instead, however, of using a table of double entry, a small auxiliary table is used to indicate what alteration must be made in the actual reading of the "attached thermometer" to obtain the value to be used as argument in the main table. For moderate altitudes, such as occur at most places in the British Isles, the alteration is not large, and the process of correcting the readings of the thermometer is much simplified.

For use with barometers at sea and at low-level stations, a barometer might be used whose attached thermometer is graduated to give directly in units of pressure the correction necessary to allow for the temperature of the instrument. Further, by making the

* Abstract of a paper read before the Royal Meteorological Society on May 20th, 1914.

scale movable, the additional corrections for altitude and gravity can be allowed for, so that one reading gives the final correction to reduce the reading to standard temperature, gravity and mean sea level.

It is an early tribute to the new units that they should lead in this way to economies in the labour of dealing with pressure data.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

June 7th, 1911.

Starting Point.	Country.	A (H_C.) miles.	B (T_C.) ° F.	C miles.	D ° F.	E miles	F
Manchester	England ..	—	—	7·3	—78	16	S.
Pyrton Hill	,, ..	7·2	—80	9·5	—76	7	W.S.W.
Brussels	Belgium ..	7·6	—89	10·5	—72	17	S.W.
Hamburg	Germany ..	8·0	—84	8·2	—82	51	S.S.E.
Lindenberg	,, ..	7·9	—71	10·4	—72	59	S. by E.
Strassburg.....	,, ..	7·7	—84	8·8	—78	39	W.S.W.
Munich	,, ..	7·8	—87	9·9	—72	37	S.W.
June 8th, 1911.							
Limerick.....	Ireland	8·0	—77	10·7	—63	19	W. by N.
Pyrton Hill	England ..	7·5	—77	10·6	—69	10	W. by N.
Brussels	Belgium ..	8·1	—78	11·6	—72	29	S. by W.
Hamburg	Germany ..	8·3	—78	8·5	—74	72	S.E.
Paris	France ...	7·5	—68	9·9	—69	12	N.W.
Strassburg	Germany ..	7·9	—78	11·4	—65	28	S.E.
Munich	,, ..	8·0	—78	8·7	—72	51	S.E. by E.
Pavlovsk	Russia	5·4	—55	9·8	—45	3	N.W.
Nishni Olchedaeff	,, ..	7·2	—75	8·0	—72	117	S.E. by E.
June 9th, 1911.							
Limerick	Ireland....	7·5	—76	8·2	—76	30	S.
Manchester.....	England ..	7·2	—81	10·5	—72	63	S.E.
Pyrton Hill.....	,, ..	7·5	—71	10·0	—56	41	S.E. by E.
Brussels	Belgium ..	7·8	—76	?	—	33	E.S.E.
Paris	France ..	7·1	—71	9·9	—63	19	E.S.E.
Munich	Germany ..	8·1	—72	9·5	—62	39	S. by E.
Pavlovsk	Russia	5·4	—57	8·0	—45	9	N.N.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On the 7th the pressure was high over West and Mid-Europe, but fell steadily without much change of distribution during the following days.

Except at Pavlovsk the value of H_C was unusually high throughout.

THE GULF STREAM.

At a meeting of the Royal Geographical Society, held on Thursday, May 21st, at the new premises of the Society in Kensington Gore, Commander M. W. Campbell Hepworth, C.B., R.N.R., delivered a lecture on "The Gulf Stream;" the chief purport of which was to prove that the warm saline waters, which contribute to the salubrity of the British Islands, are mainly derived from that stream, a branch of which, he concluded, penetrates into the north-eastern North Atlantic, and even farther north.

After a reference to the various theories, to account for currents generally and for the Gulf Stream specially, that have been advanced from time to time, and the facts that have been marshalled to disprove them, the lecturer went on to say that wind is the prime cause of all currents, and persistent winds, like the trade winds, the motive power to which all the great ocean streams may be attributed. He then traced on a current chart of the Atlantic, which was projected on the screen, the flow of the trade winds, drift currents and of the Equatorial Current, the parent of the Gulf Stream, from the sources of the drift currents to the entrance of the latter to Florida Strait and thence to the North Sea, the Norwegian Sea, the Baltic and the Barents and Greenland Seas, mentioning in passing their velocities in various localities in different seasons.

Referring his audience to charts of mean annual surface temperature and salinity of the North Atlantic, which were exhibited, he pointed out that the north-eastern portion of the North Atlantic, the southern portion of the Greenland Sea, and part of the Barents Sea, are supplied with water of the same surface temperature and salinity as that which is found in the Gulf Stream between Cape Hatteras and its place of meeting with the Labrador Current. Combating the statement that the evidence of marine biology disproves the Equatorial origin claimed for the warm stream which reaches our shores, the lecturer showed on the screen a reproduction of a Plankton map of the Atlantic—summer state—by the Swedish chemist and botanist, Clevé. Admitting that the Equatorial Plankton-types are not represented in this map, among others, in the north-eastern Atlantic, he pointed out that neither are types of Arctic origin shown farther south than 45° N., although the waters of the Labrador Current are known to penetrate to tropical regions; and he expressed the belief that no animals belonging to the oceanic Plankton can with certainty be said to be exclusively equatorial, because animals that are found in the hot water region have a wide range and spread over warm water regions. Plankton of tropical origin is, however, not infrequently found near our shores; Physalia (Portuguese Man-of-war), which frequent the tropics, was present in the English Channel in March and April, 1912; and a shoal of Liriopi (Trachomedusae) belonging to tropical regions was found off Plymouth last October. The medusoid fauna of the Gulf Stream off the Tortugas is well

known, but it has a short life, and the time limit is an important factor unless reproduction were to take place while drifting northward.

Whether the warm saline water which reaches our coast is derived from the Gulf Stream or takes its origin elsewhere must, for the present, remain an open question; but this, at least, we know, that from Florida Strait northward to the edge of the Grand Bank, thence north-eastward and eastward across the ocean, aided, doubtless, by prevailing winds, there exists throughout the year a continuous flow of warm saline water, to the north-easterly branch of which these Islands own much of their salubrity.

Captain Hepworth then showed, by means of diagrams, the somewhat frequent correlation of sea temperature with air temperature over the British Islands during the decade 1903–1912.

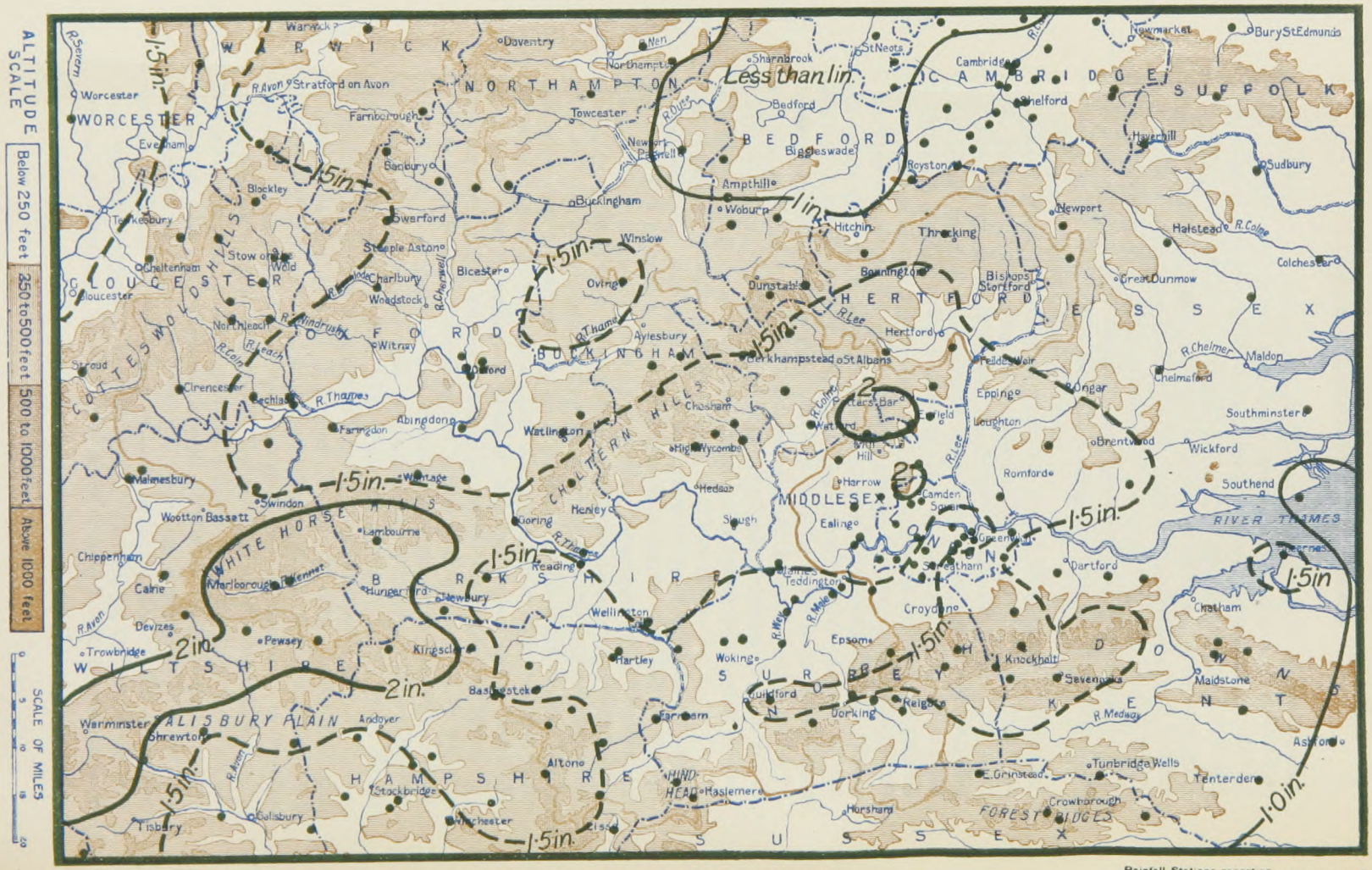
Alluding to the oft-repeated question, "Has the Gulf Stream changed its course?" he remarked that in so comprehensive a form this question cannot always be met by a negative; but, he added, that there appears to be no justification for the assumption that important changes in the circulation of the North Atlantic have taken place in historic times; but that the velocity and volume of the stream exhibit modifications that are non-periodic as well as those that are periodic, and that when the stream is abnormally active its resistance to the Labrador Current is probably carried farther north than usual, with the result that warm saline water penetrates farther north than its average seasonal limit, and *vice versa*.

The lecturer concluded by a reference to an investigation undertaken at the Meteorological Office, in the course of which there was found to be some evidence to prove that departures from the average strength of the Trade Winds, during a series of months and at times even of one month, were roughly reflected in deviations from the normal in the distribution of the surface temperature of the North Atlantic, through the agency of the Equatorial Current and Gulf Stream in corresponding months of the succeeding year; notwithstanding the many causes tending to mask the inter-relation.

Proof may therefore be claimed, he summed up, resting on a chain of evidence, that many of the climatic changes, to which our Islands are subject, owe their origin to modifications in the Trade Winds of the Atlantic, communicated through the agency of the great Equatorial Current and of its giant offspring, the Gulf Stream.

In the discussion that followed Dr. W. N. Shaw said that the extension of the Gulf Stream to waters round our coasts would, in his opinion, be marked by a steep temperature gradient in a similar manner as that which obtains at the meeting of the stream with the Labrador Current. The survival of the stream after its collision with the Arctic Current appeared to him doubtful. With regard to the influence of the sea temperature upon air temperature over the British Isles, he thought that the diagrams exhibited did not often bear out the correlation claimed in this connection, and he would not expect sea temperatures to have much influence upon our climate

THAMES VALLEY RAINFALL. ——— MAY, 1914.



because our islands lay immediately to the west of the great European Continent, which necessarily was a dominant factor.

On the motion of the Chairman a cordial vote of thanks was proposed to Commander Hepworth for his lecture.

THE WEATHER OF MAY.

TAKING the British Islands as a whole, the mean temperature of the month was in close agreement with the normal, being only 0°·2 in excess of the average. Temperature was very slightly below the normal in the west and north of Scotland and north of Ireland. In most other districts the excess was small, ranging from 0°·2 in the south of Ireland and 0°·4 in the Channel Islands to 1°·0 or more in the east of Scotland and England and the midland counties, the warmest districts being England N.E. and E., with values of 1°·8 and 1°·5 respectively in excess of the average.

The month opened with an area of high pressure lying directly over our Islands, and during the first three days very sharp frost was recorded in most districts, the lowest temperatures as a general rule being noted on the 2nd, when the shade thermometer fell to 24° at Balmoral, at Worksop (Hodsock Priory), and to 25° at Buxton. At Worksop the temperature was lower than in any May for 35 years.

On the 3rd a deep cyclonic centre appeared in the west, and for several days thereafter a large barometrical depression lay over our Islands, which was associated on the 5th with thunderstorms in the north and east. On the 7th and 8th small shallow cyclonic disturbances caused heavy rain in some northern districts, 1·90 in. falling at Cawdor and 1·27 in. at Drumnadrochit on the 7th, and 3·38 in. at Drumnadrochit, 2·50 in. at Keith, and 2·03 in. at Loch Stack on the 8th. On the 9th slight snow showers occurred in the north, and from this date till the 13th sharp frost was again noted in many localities, the lowest being 26° at West Linton on the 10th. After the 13th a spell of very fine warm anticyclonic weather set in, which continued till the 22nd, on which day the shade temperature rose to 82° at Tottenham, and 80° at Norwich and Wisley (Surrey), but in northern districts, which were largely influenced by cyclonic disturbances, comparatively cool and generally unsettled weather predominated, rain falling frequently. On the 23rd, when a low-pressure system had developed over the North Sea, a marked fall of temperature occurred, the thermometer falling about 20° to 25° lower in some parts of the south and east of England and the midland counties than on the day previous. On the 25th, 26th and 27th a remarkably severe frost occurred which did an immense amount of injury to fruit and vegetation. In most parts of the country except the Channel Islands the shade thermometer fell well below freezing point. At Balmoral, 930 feet above sea level, as low

a value as 21° was recorded on the 25th, and as far south as Marlborough a reading of 27° was noted as late as the 27th. In Ireland the sharpest frost occurred on the 25th, when Markree Castle reported a temperature of 26°. By the end of the month warmer weather was being experienced very generally.

The general rainfall for the month expressed as a percentage of the average was—England and Wales, 80; Scotland, 108; Ireland, 77; British Isles, 87.

REVIEWS.

The Rainfall of California. By ALEXANDER G. MCADIE. University of California Publications in Geography, Vol. 1., No. 4. Berkeley, 1914. Size 11 × 7. Pp. 114, 7 plates. Price 1 dollar.

THE geograpical situation of California on the western seaboard of the United States makes the study of the distribution of its rainfall a peculiarly interesting problem, but the numerous controlling factors and the great diversity of the land surface render the task one of exceptional difficulty.

Professor McAdie discusses in some detail the factors which determine the rainfall in different parts of the State, the chief of which are the movements of the permanent high and low pressure areas, the prevailing W.–E. wind drift, the proximity of the Pacific Ocean, and the land relief. The climatic features are also broadly described so far as they bear on the distribution of rainfall.

In its general nature the seasonal distribution of rainfall may be described as consisting of a single wet season in winter and an almost rainless summer. This dry season occurs over the whole State, but varies somewhat in length in different parts.

The annual rainfall is greatest in the north, exceeding 40 inches on the coast and over the Sierra Nevada. It falls off towards the south, rapidly in the valley and less so over the mountains, and the south-eastern districts receive a rainfall of less than 10 inches. Rather more than this amount falls along the coast. There is a general correspondence between the amount of rainfall and the elevation of the land, but no great success has attended attempts to express this relationship numerically. Above 7,000 or 8,000 feet no further increase seems to take place, and it is interesting to note that the rainfall maximum in the mountain region is found to lie to the west of the mountain crest. This is the reverse of the condition observed in the British Isles, where the rainfall maximum usually occurs to the leeward of the highest land. The greater elevation of the Californian mountains probably causes this reversal, but it is necessary to bear in mind that it is notoriously difficult to estimate the amount of precipitation at great elevations, and that this difficulty is enormously increased when, as is the case in the Sierra Nevada, the whole of the fall takes the form of snow. Professor Church's

experiments on snow content show that the equivalent of a foot of snow may be a very variable quantity, and Professor McAdie has himself found that 1 inch of water may be the product of as much as 20 inches of loose snow or as little as 4 inches of compact snow.

The volume contains the average seasonal (July—June) rainfall values for nearly 400 stations. The period covered by the records is however in many cases extremely short, and it is not made clear that any attempt has been made to correct short-period averages to their equivalent over a long period. Judging by the great fluctuations from year to year in the seasonal fall at San Francisco and Sacramento, the records for which are given in detail, it must be inferred that considerable uncertainty exists in some cases as to the comparability of the average values. C.S.

Meteorological Office—The Seaman's Handbook of Meteorology. A Companion to the Barometer Manual for the use of Seamen. London, H.M. Stationery Office, 1914. Size $9\frac{1}{2} \times 6$. Pp. 6 + 191 + 25 plates. Price 2s.

THIS work fills a distinct gap in the existing literature for seamen and is aptly described as a "Companion" to the well-known Barometer Manual issued by the Meteorological Office for the use of mariners. The author of the work is Commander Campbell Hepworth, Superintendent of the Marine branch of the Meteorological Office whose long experience both as a practical seaman and oceanographer, is an ample guarantee that the wide subject dealt with has been treated in a thoroughly "shipshape" and "Bristol" fashion.

Dr. W. N. Shaw contributes a preface in which the primary objects in view in the preparation of this work are set forth, these were :— "First that trustworthy information about the weather in every part of the navigable seas should be supplied to the seafaring community, and thereby the seaman should be enabled to know what to expect in the way of weather, *as a rule*, on any voyage that he might have to make. Secondly, by the use of the knowledge so collected, to enable him to make the most of conditions of weather generally favourable, by the choice of his route, or the time of his voyages, or the setting of his course ; and thirdly, by the study of the laws of weather to enable him to know what sort of weather to expect from day to day, and to make the best of bad weather, if he had to face it." In the 17 pages which form Dr. Shaw's introduction is given a very clear and eminently readable summary of marine meteorology of to-day in its practical aspects. This is a portion of the book which could be read with profit even by the land meteorologist, treating as it does with the direct application of many important investigations carried out in the Meteorological Office to the needs of seamen. In the concluding paragraphs reference is made to some aspects of world-meteorology in which the issue of seasonal forecasts for the whole earth is suggested,

the key to this problem being guardedly stated as to be found "not so much in the heat of the tropics as in the cold of the poles."

The work proper consists of eleven chapters and two appendices. In the opening sections such subjects as the atmospheric circulation, temperature, humidity, pressure and winds are treated by Captain Hepworth. Chapter IV. deals with clouds, this portion being illustrated by a beautiful coloured series of reproductions of cloud forms from the International Cloud Atlas. Subsequent chapters deal more particularly with weather phenomena in which mist, fog and precipitation are first discussed followed by a description of atmospheric pressure in relation to weather conditions, the various types of these conditions, and rules and suggestions for anticipating the weather by observations at a single station. An eminently useful chapter is number IX. which discusses the gales of our coasts, their seasonal and relative frequency from various compass points, as influenced by locality. The tracks and speed of storm centres are also referred to, this section being largely based on researches carried out by Mr. Brodie of the Forecast Division of the Meteorological Office.

Chapter X., which treats of Icebergs and other forms of drifting ice, is one of much interest incorporating as it does the most recent information regarding the polar ice of both hemispheres, the data being given not only in the form of tables but graphically. We may specially draw attention to the reproductions of the ice charts for May and August, 1911, issued by the Danish Meteorological Institute, which afford a striking example of the amount of melting that goes on in summer to the north and north-east of our Islands, in the North Atlantic, and in the Greenland and Barents Seas. The currents and ice drift in the southern hemisphere are indicated on a map of the antarctic regions (plate xxv.). This map is not quite up to date since it does not include the land discoveries or oceanic results of Dr. Filchner's expedition of 1911-12, which filled in an important gap in the Weddell Sea area. The recent results of Dr. Mawson's expedition are also absent, but these could hardly have been incorporated at the time when the map was prepared. The concluding chapter deals with meteorological instruments used on land and sea, and there are two appendices treating of the displacement of the horizon and of various aspects referring to weather reports and storm warnings, including a list of storm signal stations.

A special feature of the work is the excellent and well chosen character of the illustrations which graphically elucidate the many important points referred to in the text. One feature may be specially emphasised, namely, the large amount of research bearing on problems of practical interest to seamen which the Meteorological Office has been able to carry out in recent years and which is incorporated from time to time in the volume under notice.

This Handbook forms a valuable addition to the scientific literature of the Chart Room and is one that should also circulate extensively among students of meteorology.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

VISIBILITY.

In my opinion the haziness of the air is dependent on the character of the district from which it comes, and not on the direction of the wind. On the east and north-east coasts it is the E. and N.E. winds that are clear, the land winds, at least on the coast from Scarborough to Alnwick, are thick.

On the west coast of Scotland, which I know well, the smoke from the colliery districts of the Clyde is plainly apparent up the coast to Oban or even Fort William. From Tarbert on Lock Fyne to Crinan at the north end of the canal the E. to S.E. winds are thick, all others clear.

In South Oxfordshire (Watlington), where I have lived for eight years, with a magnificent view of 30 to 40 miles extent the same rule holds. Here winds between E. and S.E. are thick, because they come from London, a distance of over 40 miles. Winds from S.E. through S. round to W.N.W. are clear. N.W. winds are distinctly thick and a map shows the reason at once, since Birmingham and Wolverhampton lie to the N.W. Again from N. to E. the winds are clear.

In South Oxfordshire unusual visibility is certainly not a sign of rain or wind, neither do I believe it to be so on the west coast of Scotland. It is, perhaps, more prevalent in rainy weather, but after just as much as before rain, also I have often noticed it in continuous fine settled weather.

I think smoke from a place like the London or Clyde districts can be traced with precision for at least a hundred miles, and I have noticed that the layer is very thin, 2,000 ft. perhaps at the outside. Thus a balloon viewed through a theodolite often becomes more distinct with increasing angular altitude even though its distance is increasing, it is the air near the surface that obscures it, not the air of the upper layers.

W. H. DINES.

June 3rd, 1914.

THE MAY FROSTS.

You will probably be receiving accounts from different districts of the remarkable damage to vegetation done by the frosts of last month. Here the outstanding feature was the damage done to the foliage of forest trees. On the morning of May 2nd temperature in the screen fell to 23°·9, which is the lowest we have had in May since 1879, when there was a reading 0°·1 lower; on the grass the min. was 18°·5, but this is not so unusual. The result was ruin to

the prospects of the fruit crop, which up to then had been excellent. Potatoes also and other garden stuff were badly cut. The oak trees were just getting into full leaf of a bright yellowish green; on the low ground they were entirely blackened, though on higher situations they escaped, while in some cases the lower branches were cut, leaving the tops green. This remarkable effect is general over North Notts, though it does not seem to extend much further south. I am told the oaks have suffered in a similar way throughout Yorkshire and at least as far north as Durham. After four weeks a few of the trees are putting out some fresh leaves, but the general appearance of oak woods is still a dark brown. I have met with no one who remembers having seen oaks injured in this way before. Walnuts were also badly cut and are still quite black; Spanish chestnuts were much injured, and other trees, such as beech and sycamore to a less extent. Ash, which often suffer in the spring, were fortunately not out, except young plants, and these were cut. More injury was done by a frost on the 26th, which seems to have had serious consequence further south.

A gardener of experience compares the damage done on May 2nd with June 1st, 1864. Have any of your readers any records for that date?

H. MELLISH.

Hodsock Priory, Worksop, 1st June, 1914.

THE ENGLISH CLIMATE: A REJOINDER.

SINCE Mr. Alldridge, in his reference last month to my recent letter on the climate of Torquay, goes out of his way to charge me with seeming to him to "nurse a personal grudge against the British climate," I may, perhaps, be permitted to inform him that I am so deeply rooted to my native English soil that, on this consideration alone, I should never live abroad. I consider the English climate to be meteorologically most interesting and inspiring in its stormy changeable northern character, and this is why I am sometimes fond of emphasizing certain climatic features which are ridiculously supposed by some people to be "bad." The English climate, moreover, is, on the whole, extremely salubrious and admirably conducive to the moral, intellectual, and physical development of a great nation, although, as Mr. Alldridge recognises, the mean winter temperature of Penzance is some 6° higher than that of Peterborough. This, however, is nothing more than a minor climatic difference—not big enough to subvert the broad general effects of the different types of weather which affect the whole country. I grant, nevertheless, that minor differences may be important to invalids.

L. C. W. BONACINA.

Hampstead, N.W., May 19th, 1914.

A WEATHER COINCIDENCE.

THE extraordinary similarity in the weather of April and May this year seems worthy of record.

In both the first eleven days were wet, cold and rough, the lowest barometric reading being on the 7th in each month. The April rainfall in those days was 1·40 in., and in May, 1·34 in.

In both months brilliant hot sunny days with cool nights followed till the 22nd, on which day electrical disturbances brought rain in both months, and were followed by a cold snap of four days.

On April 26th there was a sharp ground frost, min. screen temp. 34°.

On May 26th the frost was even more severe, 32° being recorded (31° on the morning of the 27th).

On only one day in April (the 7th) the max. temp. did not exceed 50°.

On only one day in May (the 9th) the max. temp. did not exceed 50°.

There were three nights in April and also in May with a screen temperature of 32° or below.

It would, I think, be hard to find two so similar periods.

CHARLES P. HOOKER.

Cirencester.

THE THUNDERSTORMS OF MAY 7th & 22nd.

THE first thunderstorm of the season in London, on May 7th, was of a violence such as experience shows we ought to expect during the month of May. After a heavy, chilly shower, about 1.0 p.m., the atmosphere suddenly became oppressive, whilst a superb mountain mist of cumulus cloud, with snow-white summits and dark tawny bases, developed in the eastern sky simultaneously with the approach of a dense black storm sheet from the west. After ominous rumblings of thunder and heavy rain for two hours, there occurred, about 4.15 p.m., in South Kensington and other parts of London, a tremendous flash of forked lightning between the clouds and the earth, followed by an instantaneous crash like an explosion of dynamite—the very hall-mark of a severe thunderstorm.

The storm of the 22nd was a hot weather production. It was of a somewhat rainless, and, therefore, dangerous character in many places, but the most remarkable feature was the lack of any interval between the brilliant discharges. A bitter boreal wind followed in its wake straight from the northern ice-fields and blew for some days.

When I saw the Daily Weather Report for the morning of May 22nd and saw that the south of England lay in the neck between two anticyclonic systems—the most thundery of all types of pressure distribution—I was astonished that the forecast contained no anticipation of thunder, especially in view of the prevailing hot sunny weather.

L. C. W. BONACINA.

Hampstead, N.W., May 28th, 1914.

RAINFALL TABLE FOR MAY, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·75	1·74
Tenterden	*Kent*	51 4	*0 41	190	1·65	1·12
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·80	1·01
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	1·96	1·32
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	1·81	1·35
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	1·99	1·23
Shoeburyness	*Essex*	51 31	*0 48	13	1·27	·87
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·93	1·33
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·78	1·27
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·08	1·34
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·02	1·87
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·10	1·67
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·64	1·22
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·15	1·08
Boston	*Lincolnshire*	52 58	0 1	11	1·80	·82
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	2·08	1·56
Macclesfield	*Cheshire*	53 15	2 7	501	2·43	2·82
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	2·13	1·95
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·55	2·93
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·09	1·33
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·98	1·83
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·04	1·23
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	7·50	7·70
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·56	2·32
Haverfordwest	*Pembroke*	51 48	4 58	90	2·62	2·22
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·63	3·03
Llandudno	*Carnarvon*	53 20	3 50	72	1·86	1·76
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·87	2·33
Marchmont House	*Berwick*	55 44	2 24	498	2·53	2·06
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·98	3·37
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·40	1·85
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·53	3·25
Mull (Quinish)	,,	56 34	6 13	35	2·99	2·38
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·05	1·84
Braemar	*Aberdeen*	57 0	3 24	1114	2·33	2·19
Aberdeen (Cranford)	,,	57 8	2 7	120	2·40	2·61
Cawdor	*Nairn*	57 31	3 57	250	2·07	4·06
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·36	4·21
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·54	5·57
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·19	2·18
Wick	*Caithness*	58 26	3 6	77	2·04	2·40
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·05	1·59
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·33	1·34
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·51	1·29
Ennistymon House	*Clare*	52 57	9 18	37	2·70	2·29
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·24	1·97
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·43	1·80
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·07	1·83
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·51	2·78
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·17	2·64
Cong (The Glebe)	,,	53 33	9 16	112	2·94	2·41
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·80	2·57
Seaforde	*Down*	54 19	5 50	180	2·72	1·77
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·37	1·84
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·66	1·85

RAINFALL TABLE FOR MAY, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
— ·01	99	·90	7	8	8·68	9·98	+1·30	115	25·11	Camden Square
— ·53	68	·29	23, 31	13	9·41	11·96	+2·55	127	27·64	Tenterden
— ·79	56	·32	3	9	10·33	13·14	+2·81	127	30·48	Patching
— ·64	67	·36	3	14	11·14	12·99	+1·85	117	31·87	Cadland
— ·46	75	·30	7	15	8·33	8·07	— ·26	97	24·58	Oxford
— ·76	62	·36	22	12	9·04	6·55	—2·49	73	25·17	Croyland Abbey
— ·40	69	·27	7	9	6·23	7·52	+1·29	121	19·28	Shoeburyness
— ·60	69	·35	7	12	8·55	10·13	+1·58	118	25·40	Westley
— ·51	71	·30	8	16	7·84	8·56	+ ·72	109	23·73	Geldeston
— ·74	64	·32	3	15	13·70	18·23	+4·53	133	38·27	Polapit Tamar
— ·15	93	·56	3	16	12·15	13·10	+ ·95	108	33·54	Rousdon
— ·43	80	·40	3	13	10·65	10·62	— ·03	100	29·81	Stroud
—1·42	46	·26	11	14	11·71	10·20	—1·51	87	32·41	Wolstaston
—1·07	50	·22	22	11	10·23	7·36	—2·87	72	28·98	Coventry
— ·98	46	·22	22	13	7·91	6·80	—1·11	86	23·35	Boston
— ·52	75	·45	24	11	8·74	5·99	—2·75	69	24·46	Hodsock Priory
+ ·39	116	·43	5	15	11·91	13·66	+1·75	115	34·73	Macclesfield
— ·18	92	·38	3	18	10·70	9·65	—1·05	90	32·70	Southport
— ·62	82	1·04	3	15	23·59	25·28	+1·69	107	61·49	Arncliffe
— ·76	64	·38	23	8	9·46	7·42	—2·04	79	26·87	Ribston Hall
— ·15	92	·60	22	14	8·99	6·95	—2·04	77	26·42	Hull
— ·81	60	·32	8	14	9·51	7·38	—2·13	78	27·94	Newcastle
+ ·20	103	1·55	3	20	49·44	60·79	+11·35	123	129·48	Seathwaite
— ·24	91	·68	3	19	14·67	18·19	+3·52	124	42·28	Cardiff
— ·40	85	·59	3	11	16·71	16·38	— ·33	98	46·81	Haverfordwest
+ ·40	115	·78	5	13	15·15	18·57	+3·40	122	45·46	Gogerddan
— ·10	95	·35	8	13	10·40	10·06	— ·34	97	30·36	Llandudno
— ·54	81	·54	4	16	16·22	21·38	+5·16	132	43·47	Cargen
— ·47	81	·85	8	10	12·00	10·34	—1·66	86	33·76	Marchmont
+ ·39	113	·68	9	18	18·06	24·03	+5·97	133	49·77	Girvan
— ·55	77	·40	4	17	13·10	15·27	+2·17	117	35·97	Glasgow
— ·28	92	·80	4	20	25·68	33·31	+7·63	130	68·67	Inveraray
— ·61	80	·49	4	19	20·25	23·08	+2·83	114	56·57	Quinish
— ·21	90	·32	8	13	9·96	9·81	— ·15	98	28·64	Dundee
— ·14	94	1·06	8	14	12·97	15·10	+2·13	116	34·93	Braemar
+ ·21	109	1·14	8	16	12·00	10·47	—1·53	87	32·73	Aberdeen
+1·99	196	1·90	7	8	10·38	10·61	+ ·23	102	29·33	Cawdor
+1·85	179	1·51	8	18	18·15	17·97	— ·18	99	44·53	Fort Augustus
+1·03	123	1·55	8	18	33·48	42·57	+9·09	127	83·93	Bendamph
— ·01	100	·36	8	12	12·18	12·88	+ ·70	106	31·90	Dunrobin Castle
+ ·36	118	·94	8	20	10·88	11·04	+ ·16	101	29·88	Wick
—1·46	52	·30	5, 8	13	21·95	28·96	+7·01	132	54·81	Killarney
— ·99	58	·27	3, 9	12	14·61	14·16	— ·45	97	39·57	Waterford
—1·22	51	·23	9	12	14·81	17·68	+2·87	119	39·43	Castle Lough
— ·41	85	·61	9	20	16·49	22·03	+5·54	134	46·52	Ennistymon
— ·27	88	·43	9	11	12·83	13·13	+ ·30	102	34·99	Courtown Ho.
— ·63	74	·40	4	15	13·26	14·28	+1·02	108	35·92	Abbey Leix
— ·24	88	·44	5	17	10·15	8·13	—2·02	80	27·68	Dublin
+ ·27	111	·40	9	18	13·29	14·66	+1·37	110	36·15	Mullingar.
— ·53	83	·48	7	22	20·21	24·58	+4·37	122	52·87	Enniscoe
— ·53	82	·56	9	14	18·23	23·48	+5·25	129	48·90	Cong
— ·23	92	·43	7	18	15·72	19·25	+3·53	122	42·71	Markree
— ·95	65	·29	4	15	14·54	13·75	— ·79	95	38·91	Seaforde
— ·53	78	·44	7	16	12·93	14·64	+1·71	113	37·56	Dundarave
— ·81	70	·37	4	15	14·28	17·58	+3·30	123	39·38	Omagh

SUPPLEMENTARY RAINFALL, MAY, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	1·61	XI.	Lligwy	1·52
,,	Ramsgate	1·19	,,	Douglas	2·94
,,	Hailsham	·87	XII.	Stoneykirk, Ardwell House...	2·75
,,	Totland Bay, Aston House...	·62	,,	Dalry, The Old Garroch.....	2·93
,,	Stockbridge, Ashley..	1·25	,,	Beattock, Kinnelhead	3·36
,,	Grayshott	1·30	,,	Langholm, Drove Road	2·39
III.	Harrow Weald, Hill House...	1·86	XIII.	Meggat Water, Cramilt Lodge	2·62
,,	Caversham, Rectory Road ...	1·79	,,	North Berwick Reservoir... ..	1·51
,,	Pitsford, Sedgebrook...	1·03	,,	Edinburgh, Royal Observaty.	1·93
,,	Woburn, Milton Bryant.....	1·07	XIV.	Maybole, Knockdon Farm ...	2·22
,,	Chatteris, The Priory..... ...	·82	XV.	Ballachulish House	...
IV.	Elsenham, Gaunts End	1·12	,,	Campbeltown, Witchburn ..	2·65
,,	Colchester, Hill Ho., Lexden	1·38	,,	Holy Loch, Ardnadam.....	3·64
,,	Ipswich, Rookwood, Copdock	1·04	,,	Islay, Eallabus	2·41
,,	Blakeney..... . ..	·81	,,	Tiree, Cornaigmore	1·35
,,	Swaffham	1·12	XVI.	Dollar Academy	2·98
V.	Bishops Cannings	1·77	,,	Balquhidder, Stronvar.....	...
,,	Wimborne, St. John's Hill...	1·30	,,	Glenlyon, Meggernie Castle..	2·54
,,	Ashburton, Druid House.. ...	2·23	,,	Blair Atholl	1·58
,,	Cullompton	2·01	,,	Coupar Angus	1·84
,,	Lynmouth, Rock House	2·09	,,	Montrose, Sunnyside Asylum.	1·98
,,	Okehampton, Oaklands.. ...	2·02	XVII.	Alford, Lynturk Manse	2·78
,,	Hartland Abbey.....	1·45	,,	Fyvie Castle	4·11
,,	Probus, Lamellyn.....	1·21	,,	Keith Station	4·83
,,	North Cadbury Rectory.....	2·11	XVIII.	Rothiemurchus	3·34
VI.	Clifton, Pembroke Road.....	2·02	,,	Loch Quoich, Loan	10·95
,,	Ross, The Graig	1·64	,,	Drumnadrochit	5·66
,,	Shifnal, Hatton Grange.....	1·28	,,	Skye, Dunvegan	3·41
,,	Droitwich.....	1·67	,,	Lochmaddy Bayhead	1·39
,,	Blockley, Upton Wold.....	1·73	,,	Glencarron Lodge	5·46
VII.	Market Overton.....	1·70	XIX.	Invershin	1·92
,,	Market Rasen	2·16	,,	Melvich	3·31
,,	Bawtry, Hesley Hall	1·39	,,	Loch Stack, Ardchullin	6·57
,,	Derby, Midland Railway.....	1·79	XX.	Skibbereen Rectory	1·41
,,	Buxton	3·09	,,	Dunmanway, The Rectory ..	2·04
VIII.	Nantwich, Dorfold Hall	1·90	,,	Glanmire, Lota Lodge, No. 1	1·51
,,	Chatburn, Middlewood	2·19	,,	Mitchelstown Castle	1·56
,,	Cartmel, Flookburgh	2·62	,,	Darrynane Abbey.....	2·20
IX.	Langsett Moor, Up. Midhope	1·86	,,	Clonmel, Bruce Villa	1·43
,,	Scarborough, Scalby	2·03	,,	Newmarket-on-Fergus, Fenloe	1·64
,,	Ingleby Greenhow	2·34	XXI.	Laragh, Glendalough	2·73
,,	Mickleton	2·20	,,	Ballycumber, Moorock Lodge	1·76
X.	Bellingham, High Green Manor	2·18	,,	Balbriggan, Ardgillan	1·90
,,	Ilderton, Lilburn Cottage ...	1·54	XXII.	Woodlawn	1·93
,,	Keswick, The Bank.....	2·40	,,	Westport, St. Helens	2·65
XI.	Llanfrechfa Grange	2·19	,,	Dugort, Slievemore Hotel ...	3·29
,,	Treherbert, Tyn-y-waun	5·27	,,	Mohill Rectory	2·02
,,	Carmarthen, The Friary	3·03	XXIII.	Enniskillen, Portora.....	1·61
,,	Castle Malgwyn [Llechryd]...	2·07	,,	Dartrey [Cootehill]	1·39
,,	Crickhowell, Tal-y-maes.....	2·80	,,	Warrenpoint, Manor House ..	1·68
,,	New Radnor, Ednol	2·06	,,	Banbridge, Milltown	...
,,	Birmingham WW., Tyrmynydd	3·46	,,	Belfast, Cave Hill Road	2·05
,,	Lake Vyrnwy	3·19	,,	Glenarm Castle..... ...	1·81
,,	Llangyhanfal, Plâs Draw.....	1·89	,,	Londonderry, Creggan Res...	2·41
,,	Dolgelly, Bryntirion.....	5·10	,,	Dunfanaghy, Horn Head ...	2·45
,,	Bettws-y-Coed, Tyn-y-bryn...	3·04		Killybegs	3·70

METEOROLOGICAL NOTES ON MAY, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Unsettled weather characterised the first fortnight, a few brilliant days contrasting markedly with the generally dull, cheerless weather. A week of beautiful sunny and warm weather followed, several days being practically cloudless. The last week was again unsettled with low temp. Mean temp. 55°·2 or 1°·2 above the average. Duration of sunshine 187·1* hours, and of R 19·6 hours. Evaporation 2·56 in. Shade max. 82°·9 on 22nd; min. 37°·7 on 26th. F 0, f 0.

TENTERDEN.—The effect of the dry weather is seriously felt. Hot from 19th to 23rd, then cold with ground frosts at night. Duration of sunshine 229† hours. Shade max. 77°·5 on 22nd; min. 35°·5 on 26th and 27th. F 0, f 6.

TOTLAND BAY.—The driest May for 10 years. Duration of sunshine 216·2* hours. Shade max. 71°·1 on 18th; min. 37°·8 on 26th. F 0, f 2.

PITSFORD.—Mean temp. 51°·7. R 1·01 in. below the average. Shade max. 75°2 on 22nd; min. 28°6 on 2nd. F 4.

IPSWICH, COPDOCK.—The first 14 days were dull, cold and damp, after which a brilliant spell of sunshine set in lasting on and off till the close, though only the 18th to 23rd were warm. Mean temp. 51°·8. Duration of sunshine 219·8* hours. Shade max. 77°·3 on 21st; min. 33°·0 on 29th. F 0, f 10.

POLAPIT TAMAR.—An unseasonable month. Dry with high day and low night temp. Shade max. 73°·0 on 19th; min. 32°·3 on 26th. F 0, f 4.

NORTH CADBURY.—A month of violent changes and extremes. Frosts on 26th and 27th did considerable harm. Shade max, 80°·5 on 22nd; min. 33°·0 on 27th. F 0, f 6.

HODSOCK PRIORY.—Unusual damage done by frosts on 2nd and 26th. Shade max. 74°·1 on 18th; min. 23°·9 on 2nd. F 4, f 10.

SOUTHPORT.—An unusual deficiency of E. winds, a feature that has characterised the whole spring. Duration of sunshine 165·5* hours, and of R 52·1 hours. Mean temp. 50°·7 or exactly normal. Evaporation 2·46 in. Shade max. 68°·0 on 16th; min. 33°·0 on 2nd. F 0, f 6.

HULL.—Showery from 3rd to 13th, then fine and dry to 21st. Warm and sultry on 22nd with severe TS at night. Duration of sunshine 101·2* hours. Shade max. 73°·0 on 18th; min. 34°·0 on 10th and 26th. F 0, f 5.

HAVERFORDWEST.—Duration of sunshine 210·4* hours. Great damage done by frost. Shade max. 66°·6 on 15th; min. 33°·0 on 26th.

LLANDUDNO.—Shade max. 69°·0 on 16th; min. 35°0 on 2nd.

CARGEN.—A sunless though dry month. Last 9 days unusually cold. Shade max. 72°·0 on 15th: min. 34°·0 on 26th and 27th.

EDINBURGH.—Shade max. 69°·6 on 17th; min. 33°·6 on 10th. F 0, f 7.

COUPAR ANGUS.—Severe frost on 25th did much damage to early fruits and exposed potato fields. Shade max. 72°·0 on 17th; min. 28°·0 on 25th.

DRUMNADROCHIT.—Persistent cold winds mainly from N. On 7th and 8th R fell continuously for 28 hours, the aggregate fall being 4·65 in. of which 3·38 in. fell on 8th, a record daily fall. Frost on 25th caused general destruction of young growths of vegetation and garden produce.

LOCH STACK.—Duration of sunshine 122·7* hours.

DUNMANWAY.—A fine month and warm from 12th to 21st. Severe frost on night of 24th injured potatoes in low lying fields.

DUBLIN.—A generally favourable month of average temp., but with alternate periods of severe cold and moderate warmth for the time of year. Mean temp. 52°·4 Shade max. 68°·8 on 17th; min. 35°·5 on 25th. F 0, f 0.

OMAGH.—The weather up to the 12th was cold and wet, remainder of month was fine, but temp. below average. Frost on 24th considerably damaged potato crop.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, December, 1913.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	55·3	9	26·9	25	46·2	37·3	37·5	86	70·7	22·7	·79	8	7·1
Malta	65·3	4, 26	43·5	10	63·6	51·4	47·7	75	132·0	..	2·71	10	1·4
Lagos	99·5	17	68·0	26	90·4	73·6	72·2	73	143·2	64·4	·11	2	4·6
Cape Town	87·1	21	49·5	12	73·9	56·7	53·8	67	...	...	1·53	8	4·4
Natal, Durban ...	80·0	15	60·0	27	74·5	67·1	66·7	79	...	...	6·11	13	6·0
Johannesburg	90·0	23	49·6	5	80·3	56·7	54·4	66	162·9	47·5	3·31	14	4·4
Mauritius	92·1	6	68·0	28	85·2	71·3	68·0	73	159·5	60·5	5·37	18	6·4
Bloemfontein	96·4	22*	47·3	4	88·5	59·4	53·8	68	...	...	·00	0	2·7
Calcutta...	81·1	10	48·3	28, 29	76·0	56·8	55·4	69	...	38·5	·14	1	2·1
Bombay...	87·7	16	63·7	26	83·5	69·8	65·8	70	135·5	53·2	·00	0	1·3
Madras	85·6	9	66·1	25	83·1	71·1	69·9	83	133·3	63·3	9·51	12	5·2
Colombo, Ceylon ...	89·2	25†	65·4	28	85·3	72·3	71·9	81	162·2	54·8	11·77	18	5·6
Hongkong	72·5	15	44·4	31	64·9	56·5	51·0	68	...	...	1·39	9	6·7
Sydney	95·2	25	57·3	17, 21	77·3	62·9	54·9	55	153·8	46·5	·23	6	5·6
Melbourne	99·9	29	47·3	1	79·7	56·4	50·0	50	164·8	40·6	1·48	5	3·8
Adelaide	110·7	1	51·7	26	86·1	61·7	50·5	40	168·4	43·1	2·47	2	3·2
Perth	96·1	27	50·3	5	76·2	59·4	56·3	67	159·0	44·0	1·68	14	4·5
Coolgardie	106·2	10	50·4	22	88·8	61·6	51·8	42	170·6	47·8	2·30	5	2·3
Hobart, Tasmania ..	101·3	30	44·0	7	69·2	51·8	46·4	57	154·1	39·9	1·75	12	6·7
Wellington	78·8	31	44·0	6	65·4	52·7	51·2	75	145·2	32·0	7·51	19	7·4
Auckland	...	...	...	...	66·3	54·2	..	...	...	...	2·80	16	...
Jamaica, Kingston ..	89·3	5	67·6	2	87·0	69·2	67·0	78	...	...	·17	5	3·6
Grenada	87·0	25	70·0	20	82·9	73·1	...	77	136·0	...	5·50	16	4·0
Toronto	53·7	5	6·4	27	39·3	27·4	27·2	83	99·4	4·3	1·04	6	...
Fredericton	47·0	8	-12·5	29	31·5	15·6	...	79	...	...	2·69	10	6·0
St. John, N.B. ...	50·2	8	8·5	28	35·7	22·2	23·0	76	...	...	3·72	15	6·0
Edmonton, Alberta ...	59·3	10	-10·0	25	31·6	12·8	...	82	98·9	-11·8	·10	5	4·3
Victoria, B.C.	50·0	14	33·7	21	46·0	33·7	40·0	87	...	...	1·35	14	7·0

* and 23. † and 28.

MALTA.—Low rainfall.

Johannesburg.—Bright sunshine 283·3 hours.

Mauritius.—Mean temp. of air normal, dew point 0°·5 above, and R ·51 in. above, averages. Mean hourly velocity of wind 11·2 miles, or 0·4 above average.

Bloemfontein.—The first December without rain on record.

COLOMBO.—Mean temp. of air 78°·8, or 0°·3 below, of dew point 0°·4 above, and R 6·42 in. above, averages. Mean velocity of wind 4·2 miles per hour. TSS on 9 days.

HONGKONG.—Mean temp. of air 61°·0. Mean hourly velocity of wind 9·9 miles. Bright sunshine 124·8 hours.

Melbourne.—Mean temp. of air 3°·4 above, and R ·82 in. below, averages.

Adelaide.—Mean temp. of air 2°·8 above, and R 1·53 in. above, averages; 2·42 in. of rain fell on one day, a record for December.

Perth.—Rainfall below the average.

Coolgardie.—Temp. of air 0°·1 below, and R above, averages.

Hobart.—Temp. of air 0·2° above, and R ·18 in. below, averages.

Wellington.—Rainfall over double the average. Total sunshine 218·2 hours.

JAMAICA.—Rain much below average.

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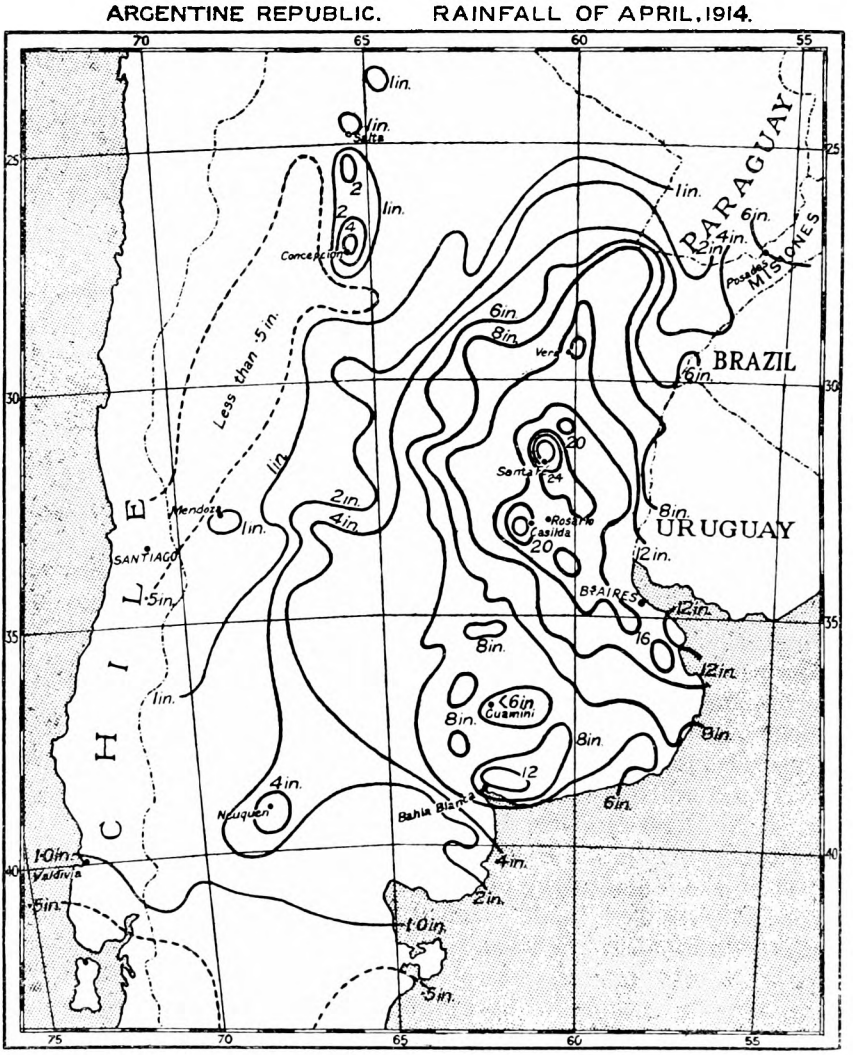
THE EDINBURGH METEOROLOGICAL CONFERENCE.

The programme which has just been issued in connection with the Meteorological conference to be held in Edinburgh, from September 7th-12th, by invitation of the Scottish Meteorological Society, is one that should appeal strongly to all interested in the science of Meteorology. The beauties and academic attractions of the modern Athens, combined with a Conference of such advantage to all students of Meteorology, should ensure a large gathering. Proceedings will open on the Monday evening (September 7th), with a reception, and on the Tuesday morning the President, Admiral Sir Edmond Slade, K.C.I.E., K.C.V.O., will deliver an address. The same evening the visitors will be the guests of Mr. J. Mackay Bernard, the President of the Scottish Meteorological Society. A reception will also be held at the City Chambers on the invitation of the Lord Provost, Magistrates and Council of the City of Edinburgh. Popular lectures will be given on other evenings by Mr. C. J. P. Cave on "The Exploration of the Atmosphere," and Mr. C. T. R. Wilson, F.R.S., on "Atmospheric Electricity." The Conference will on most days meet in two sections and opening addresses will be delivered by Professor R. A. Sampson, Astronomer Royal for Scotland, on "Meteorology as an Exact Science," while Dr. Shaw will speak on "The Position of the Observational Physical Sciences in British Universities and Schools." Dr. Chree will give an address on "Terrestrial Magnetism," and Mr. J. S. Dines will discourse on "Meteorology and Aeronautics." The other opening addresses will be delivered by Dr. Shaw, "Correlation in the Meteorology of the Globe," ; Dr. G. A. Carse, "Atmospheric Electricity " ; and Prof. D'Arcy Thompson, C.B., "Periodic Variations in Mean Sea-level." In addition to the opening addresses nearly twenty papers, many by well-known meteorologists, have been already promised. A number of interesting excursions have been arranged, one of which will be to the Royal Observatory on the invitation of Prof. Sampson, when a demonstration of Balloons for meteorological purposes will take place.

Other attractions of a varied character have been arranged, full particulars of which will be found in the circular which appears in this issue of the Magazine.

HEAVY RAINS IN THE ARGENTINE REPUBLIC.

THROUGH the kindness of Mr. W. G. Davis, Director of the Argentine Meteorological Office, we are able to give a map showing the rainfall of April over the Argentine Republic and contiguous regions north of latitude 37°S. This map was prepared by Mr. Helm Clayton, Chief of the Forecast Division, and shows in a striking manner the



remarkable character of the April rains to which reference was made in our last number. The map explains itself, but Mr. Clayton has added some general particulars of considerable interest. He says " at the same time that this heavy rainfall was occurring in

Argentina, the rainfall was so light in Misiones and Southern Brazil that the Alta Parana at Posadas was the lowest ever observed, so far as shown by the records of the Hydrometric section. The rainfall in southern Chile was also abnormally low and had been below normal for several months preceding." Mr. Clayton has given some of the actual monthly rain totals, from which it appears that the rainfall in Buenos Ayres was 14·29 in., Rosario 15·83 ins., Santa Fe 24·80 ins., and Santo Tomé, in the province of Santa Fe, 30·35 ins. The normal April rainfall for the first three stations quoted above is respectively 3·00, 3·11, and 3·35 ins., so that from five to eight times the average fall was experienced at the places under consideratiom. At Buenos Ayres the only wetter month since the record began in 1861 was March, 1900, when 21·44 ins. fell, the previous wettest April having been that of 1884, when 8·35 ins. was recorded. From the isohyetal lines it would appear that at Ajo the rainfall was about 12 ins., the only wetter months since 1858 being those of March, 1900 (15·88 ins.) and September, 1884(12·64 ins.). On the other hand from about latitude 40° to 42° S., on the Chilian littoral, and probably further south, a remarkable deficiency was noted, Valdivia having about an inch and Puerto Montt only 0·40 in. of rain in April, against an average of 9·33 and 7·05 ins. respectively. Reference to a long record at Puerto Montt shows that the driest April previously recorded was 2·72 ins. in 1896.

While it is very difficult, in the absence of weather maps, to form a picture of the precise conditions that led to these remarkable variations in rainfall on the South American continent, between the Tropic of Capricorn and latitude 37°, it is quite obvious, from the Chilian data, that the South Pacific high pressure system was not only lying further south and east, but was also more intense than usual. The cyclonic disturbances that gave the heavy Argentine rains apparently came from the Atlantic, so that we should expect to find that the southern high pressure belt over this ocean was located north and west of its normal situation.

THE WEATHER OF JUNE.

The mean temperature of the month, taking the British Isles as a whole, differed but little from the average. From the data given in the *Weekly Weather Reports* of the Meteorological Office, it was found that the only district showing a temperature below the normal was the north of Ireland. In the Channel Islands the mean temperature was just the average, and there was an excess of about 1° in the north-eastern part of the country, in the Midland Counties, and in the south of Ireland. In western districts, except for a burst of very unusual warmth during the third week of the month, cool weather prevailed in general, but in eastern districts the warmth

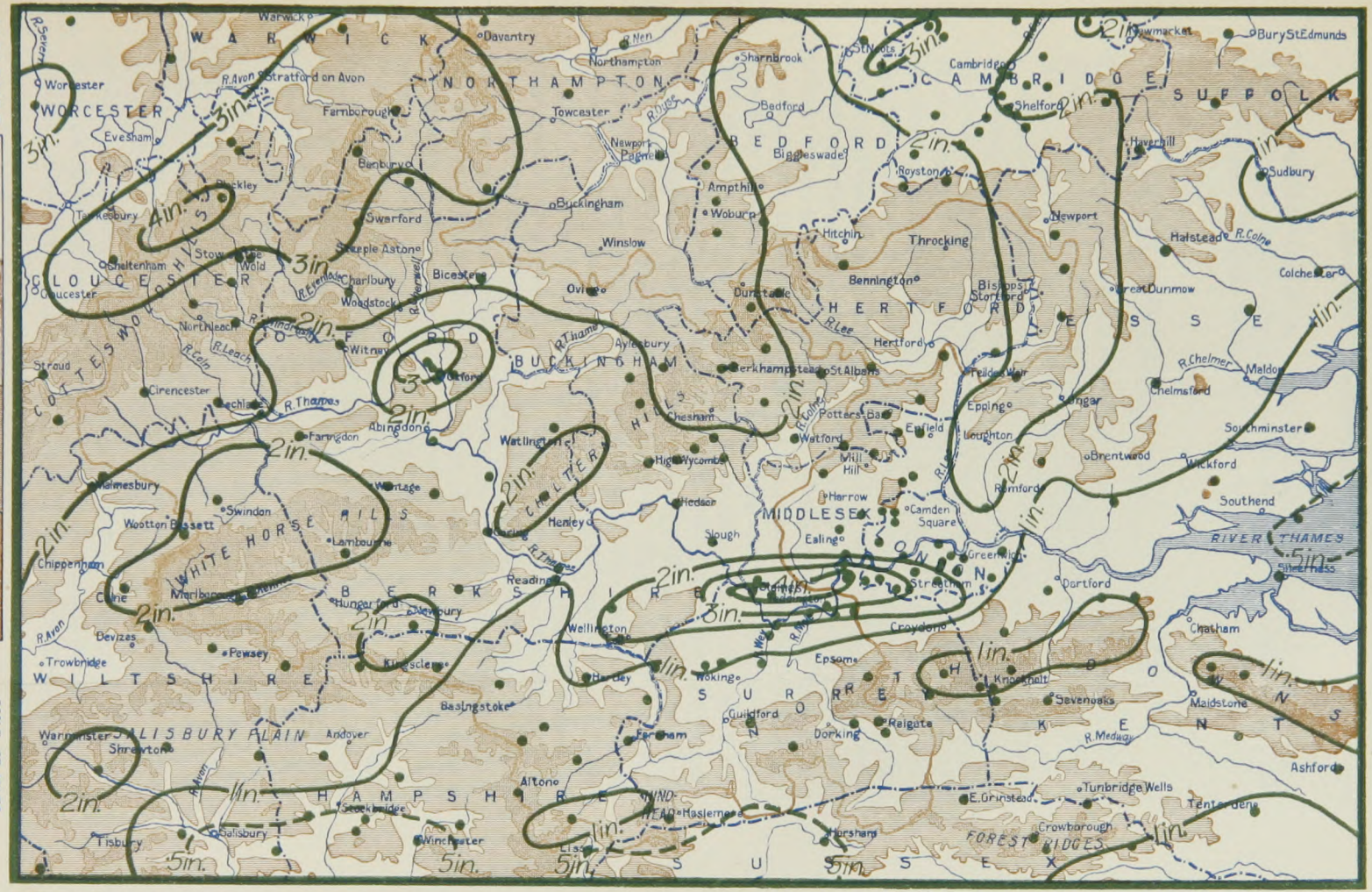
continued in a modified degree until the close of the month, when very warm weather was being experienced.

At the beginning of the month a shallow depression, in its passage across Scotland and the adjacent portion of the North Sea, was accompanied, on the more exposed parts of our northern coasts, by winds of gale force blowing from the west or north-west. Cold weather was experienced, the shade thermometer on the 1st falling to freezing point at West Linton, and on the 3rd to 33° at such widely separated localities as Balmoral, Rounton, and Falkirk. At Crieff on this day temperature rose to 78°, but at Blackpool and Valentia did not exceed 62°. Until about the 12th, temperature continued, on the whole, under the average, the day maxima being low and with minima falling on the 7th to or below freezing point in some parts of Scotland, the lowest being 31° at Balmoral. Thunderstorms were frequent and accompanied by daily rains exceeding an inch and a half in some localities.

An irregular type of pressure distribution on Sunday, the 14th, was associated with a remarkable thunderstorm in South London and the lower Thames valley. The focus of maximum rainfall appears to have occurred in the vicinity of Richmond Park, where 3·7 in. fell within two hours and forty-five minutes. Rainfalls exceeding 3 in. occurred at Staines, 3·47 ins., and at Ashford (Middlesex) where 3·3 ins. was recorded. More than two inches fell on this day in an elliptical area extending from Dulwich to west of Egham, the total width of the two-inch area being, on the average, four miles. Although the limits of this storm were pretty sharply defined, no rain falling in many areas contiguous to that of heaviest fall, yet it is of interest to note that in the vicinity of Petersfield, and also in south Somerset, thunderstorms and torrential rains reaching to slightly more than two inches were recorded synchronously with the London storm. Hail in both storms was of general occurrence and in some cases of remarkable size. On the 19th a local rainstorm of quite exceptional severity was responsible at Carr Bridge (Inverness), for an extraordinary railway accident.

Some high temperatures occurred after the middle of the month, the maximum, at Balmoral on the 17th, rising to 88°, some five degrees higher than at any other reporting station in the British Isles. After this date, until very nearly the close of the month the weather conditions were comparatively normal, except the duration of bright sunshine, which was abundant in most places. A ground frost was recorded at Wisley on the 24th. On the 29th a marked rise of temperature occurred very generally, and on the last day of the month maxima ranging from 86° to 89° were recorded at the London stations, while values of 84° were noted in the Midlands. The high day values were also associated with unusual nocturnal warmth, the night minima being above 60° at many places in the south and east of England.

THAMES VALLEY RAINFALL. —— JUNE, 1914.



The general rainfall of the month expressed as a percentage of the average was:—England and Wales, 79 ; Scotland, 59 ; Ireland, 42 ; British Isles, 64.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the Session was held on Wednesday afternoon, June 17th, at 70, Victoria Street, Westminster, Mr. C. J. P. Cave, M.A., President, in the chair.

Mr. B. C. Wallis read a paper on "The rainfall of the Southern Pennines," in which he endeavoured to show that Lancashire owes its predominance in the cotton trade to the wetness and humidity of its climate. He made an examination of the average monthly pluviometric coefficents for a period of 35 years, and of the monthly variations in wind direction for twelve places in relation to the rain accompanying these winds, for a period of four years. The cotton towns are localised roughly on the 500 ft. contour on the slopes which form the catchment basin of the Irwell and Mersey river combination while the woollen towns are roughly at the same elevation beyond the hills. The difference in rainfall between west and east averages one inch per month, and during the winter months rainfall increases with the elevation, while during the summer rainfall decreases relatively with the elevation ; consequently at about the level of 500 ft. the rainfall is distributed most evenly throughout the year. The heaviness of the rainfall above the towns tends to keep the streams full, so that when they debouch on the lowland they wind and meander and lie like canals to the windward side of the cotton towns. Consequently the air of south-east Lancashire tends to be humid, the crescent circle of Upland restricts the free passage of the westerly and south-westerly winds, and the relative excess of warmth which characterises the air adds to the extent of the evaporation from the water surfaces of the many streams. Thus the local relief of the Pennine Upland gives to the cotton towns their characteristic climate, and is the dominant factor which has made Lancashire supreme in the cotton industry.

In the discussion that followed Mr. C. Salter gave a description of a series of maps of the average monthly rainfall in the British Isles, constructed by Dr. Mill and himself, some years ago, using a method somewhat similar to that followed by Mr. Wallis. On these maps were plotted the percentage of the years' total rainfall falling in each month on the average of 35 years, and these results were of considerable interest. In winter, for example, the greatest proportion of the year's rain fell at wet stations, in summer at dry stations. In spring and autumn the proportion was almost uniform in all parts of the country, but the fall was, on the whole, twice as great in October as in April. He regarded these maps as a convenient

steeping stone to the construction of monthly average rainfall maps, and proposed to attempt to combine them successively with a detailed map of the average rainfall with this object in view.

Mr. E. Gold pointed out that the " equipluves " were really the relation of the mean rainfall of a particular month with the mean rainfall of the year. He doubted the value of such " equipluves " as the range of values might conceivably be from 1200 to 0.

Mr. F. J. Brodie said that in the winter months the rainfall percentages were higher in the western part of the country, and in the summer months higher in the eastern parts. This might be due to the fact that the winter rain was generally cyclonic rain, while that in summer was mostly of the thunderstorm type. He believed thunderstorms were far more frequent in the east of the Kingdom than in the west.

Mr. E. M. Eaton differed emphatically from the author and urged that the reason the cotton industry was on the western slopes of the Pennines was owing to its proximity to the western ports and because the raw materials can be readily obtained. The industry cannot live in Derbyshire because they cannot get the materials at a price that would pay for working

In reply to Mr. Gold, Mr. Wallis said that such a range as he suggested would only occur in dealing with tropical data. He thought that 150 to 60 would be about the limits in this country. He asked Mr. Eaton, if his argument held, why was there no cotton industry in the neighbourhood of Bristol, and of Glasgow, and why did it not pay at Warrington ?

Mr. H. J. Bartlett read a paper on the " The relation between wind direction and rainfall " He examined the relation between wind direction and amount of rain from the hourly readings obtained from self-recording instruments at the four Observatories at Valencia, Aberdeen, Falmouth, and Kew for the decade 1901-1910. At the four Observatories a large proportion of the total rain falls with wind in the south-east and south-west quadrant, except in the case of Aberdeen, where the amount in the north-west quadrant is relatively high. The greatest amounts at Kew and Falmouth are with a south-west wind, respectively 22 and 28 per cent. At Aberdeen the south-east wind brings the highest amount, 20 per cent., while Valencia receives 30 per cent. with south, 20 per cent. with south-east, and 15 per cent. with the south-west wind during the year. The author showed graphically the percentage of winds in each quadrant for each month of the year at all four Observatories.

A third paper on " Barometric changes and rainfall," by Mr. E. H. Chapman, M. A.,was also read. The author endeavoured to ascertain a numerical measure of the relationship existing between barometric pressure and its changes and rainfall under various conditions. Five places, Southampton, Woolacombe, Armagh,

Laudale and Scarborough, were dealt with and the data were extracted from " Observations at Stations of the Second Order " for the years 1900 to 1906. That rain follows a fall in pressure more often than not is well-known, but these results showed that the probability varies according to the direction of the wind, and the absolute height of the barometer. It is worth noting, too, that rain foretells a rise in the barometer, with rather more probability than does a fall in the barometer foretell rain.

The following gentlemen were elected Fellows of the Society—Mr. Joseph Edward Evans, Mr. Y. I. A. Lalljee, Professor L. A. H. Warren, Lieut. W. B. Wilkinson, R.N.R.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

VISIBILITY.

As your correspondents have lately been discussing " Visibility " or what I have in my papers called " the limit of Visibility," I would like to call attention to some results obtained from observations made here and published in the *Pro.Roy.Soc.Edin., 1892-93* Falkirk, owing to its situation, is particularly well suited for such observations, as the whole area within the N.W. quadrant is extremely thinly populated, so that the air coming from it to the place of observation is but little polluted, while the area from E. by S. to W. is at a distance of some miles densely populated and contains many Iron Works and other sources of pollution. The N.E. quadrant is much less densely populated. Some hundreds of observations were made, but these were reduced to a little over 200 by the rejection of a number which were unsuitable owing to recent rains, distant showers, and other unstable conditions.

The limit of visibility was measured by the visibility of more or less distant hills, Ben Ledi, distance 25 miles, was used when the air was clear, and nearer hills when it was invisible owing to haze.

The observations were placed in tables according to the direction of the wind and the humidity of the air at the time. For instance, the average of all the observations taken when the wind was from each direction and the wet-bulb depression was 2° being placed in one column, all those when it was 3° in the next column, and so on. The table thus shows the limit of visibility for each direction of wind at the different humidities.

By comparing the limit of visibility on the days when the air had the same humidity, the relative transparency of the winds from the

different directions has been obtained, that is the relative transparencies of the air from polluted and from unpolluted areas.

Winds from W., N.W. and N., are more than 9 times clearer than the southerly winds when the air is dry enough to give 3° or more of wet-bulb depression.

The air at Falkirk is about 10 times more hazed when the wind is E., S.E., S. and S.W., than it would be if there were no inhabitants in the country.

The transparency of the air increases with its dryness being 3·7 times clearer when the wet-bulb depression is 8° than when it is 2°.

The transparency of the air at any particular place would thus appear to be affected by its humidity, and by the density of the population in the direction from which the wind at the time blows. The effects of pollution are decreased by high winds.

Besides the impurities in the atmosphere other things affect its transparency. For instance, if the observations are made while looking towards the sun, the air seems to be much more hazed than when looking away from it. Want of uniformity in the humidity, and the temperature of the air, also reduce its transparency; while a uniform canopy of clouds seems to increase it, probably by preventing the sun shining directly on the impurities, and by tending to promote a uniform condition of temperature and humidity in the air.

JOHN AITKEN.

Ardenlea, Falkirk, 20th June, 1914.

I THINK, with Mr. Dines, that there is no very definite connection between the transparency of the atmosphere and ensuing rainfall, except in extreme cases of visibility, so far as my experience goes, usually *do* portend rain.

When from Folkestone the French coast appears so near that the churches and trees in and around Boulogne can be clearly discerned, then the fishermen shake their heads. Similarly when from London-hackneyed Parliament Hill one can sometimes in summer see right across the city to the North Downs, an almost incredible other-world vision of the Kentish or Surrey hill lanes, then one may usually suspect showers, if not more pronounced rain, to be gathering.

L. C. W. BONACINA.

June 18th, 1914.

As a very amateur but very interested Observer for many years, it is with the greatest diffidence that I venture to write anything which conflicts with the opinion of so eminent a Meteorologist as Mr. Dines.

But I have been since boyhood a keen boat sailor and have associated with fishermen and yacht hands whose livelihood (and

sometimes lives) depend on accurate weather forecasting. They all agree with me in the statement, that here, at all events, winds from N.N.E. round to S.S.E. are accompanied by haze, especially when anti-cyclonic. I am not speaking of actual fog, which is frequent with S. and S.W. winds. Smoke will certainly not explain this haziness, as there is no land S. of a S.E. bearing here, and then only the Isle of Wight and the southern part of England on the bearings round to N.N.E. Whilst N. and W. and S. winds are clear as a rule.

On the other hand, *unusual* clearness is invariably associated here with rain, either recent or to come, whether in the day or in the night It is not seen when an anti-cyclone is giving place to a cyclonic system, but it is invariable, I may almost say, in the interval between successive cyclonic disturbances, and I regard it as a more reliable sign of coming rain in these circumstances than even a backing wind. When the houses on St. Catherine's Point can be seen from here, rain is certain in the next twenty-four hours, or, as the fishermen say at night, " The stars are right aboard of you."

FRANK BELBIN, F.R.C.S.

25, Knyveton Road, Bournemouth, June 22nd, 1914.

I THINK Mr. Dines' letter on this subject is so clear and convincing as to leave little or nothing more to be said on the general question, except that it leads one to the conclusion that it would be difficult to find any place in this country where visibility would be determined entirely by natural causes, to the exclusion of those which may be termed artificial.

Mr. Horner's observations and mine certainly seem discordant, but I think the local conditions at all the places he mentions, if duly considered, afford an explanation. Ilfracombe is surely quite within the influence of the South Wales coalfield. At Worthing his view of Brighton with an easterly wind would be obscured by the smoke of Brighton itself, which is by no means a negligible quantity; and at Wesgate-on-Sea he has Margate, a good-sized town, immediately to the east of him.

H. S. TABOR, F.R.Met.Soc.

Fennes, Braintree, July 6th, 1914.

I AM very surprised at Mr. Dines not thinking visibility a sign of rain. Hereabouts it is always considered to be one. For instance, when certain landmarks are unusually clear, such as Lympne Castle, 15 miles E., the hills near Ightham, 23 miles N.W., (on this side of Sevenoaks), Fairlight Church (near Hastings,) and Brightling Obelisk, 14 and 16 miles S. and S.W. respectively, or when the mid-Kent chalk range to N. is clear and distinct above the parallel

ragstone range; specially too, when the telescope shows ships off Hythe and Romney. As an example of this on August 18th, 1909, I saw the Folkestone boat crossing, 24 miles off, and a fortnight of wet weather followed. Again, and this perhaps is even more noteworthy, when at night the flashes of Grisnez Lighthouse, 42 miles E., and the glare of London, 46 miles N.W., illumine the clouds, bad weather generally follows. A particular instance being one night in December, when the London light was very conspicuous, and there came a heavy snowstorm next day.

The N.W. wind is often thick, probably from London smoke, this may perhaps lessen visibility after rain here.

J. E. MACE.

View Tower, Tenterden July 6th, 1914.

THUNDERSTORM OF JUNE 14th.

THE phenomena associated with the thunderstorm of June 14th are, in some respects, so interesting that I am anxious, if possible, to carry out an investigation of the storm on the same lines as that of the " Derby Day " thunderstorm of May 31st, 1911.

Readers of *Symons's Meteorological Magazine* would assist greatly in the enquiry if *any* information relative to the storms could be sent to me at the address below. The information most valuable would be precise data of the *time* at which rain fell, or did not fall. The fact that rain was not falling may be of equal importance to the fact that it was falling, and negative information should not be omitted. Other observations of value would be those of the time of hail, thunder, lightning, etc., and particulars of the time that the sky became clouded, or free from cloud would not be without value.

I should like to take this early opportunity of thanking all those who have already sent me reports, many of them most valuable. The investigation will necessarily take some time, so that it may be a good many months before results are ready for publication.

J. FAIRGRIEVE.

Frocester, Friern Lane, New Southgate, London, N.

No doubt you will have different accounts of the thunderstorms which passed over South London on Sunday afternoon, because some places were flooded out, while at others only a few drops of rain fell. The first storm began here at about 12.24 p.m., and came right overhead from east, with terrific flashes of forked lightning and loud peals of thunder, then at 12.31 p.m. down came the rain with extraordinary fury; within 9 minutes ·50 in. had fallen. The second storm came up just after 1 p.m., the lightning

being even more severe, At 1.30 p.m. St. Mark's Church, Clarendon Road, was struck, and the Holy Cross, Catford, and a tree in Hither Green Cemetery, over thirty feet in height, was splintered, and two houses were also struck at Catford. The peals of thunder shook the house dreadfully, another came up at 2.25 p.m. with torrents of rain, and hailstones as large as haricot beans fell for about five minutes, being the largest I have ever seen; the flashes of lightning were very dangerous, and were followed by awful peals of thunder which caused sensible vibrations again. Four more storms passed over and around us between 3 and 5 p.m., but were only slight; by evening the clouds cleared, and the sun shone brightly everywhere. So still and delightful after such a day of storms, which will be remembered in this district for many years to come.

G. E. DACEY.

Lewisham.

If a full account of the thunderstorms of the 14th inst. is undertaken the following notes may be helpful. My house, at 350 feet, gives a clear outlook northwards.

1. The storm did not give any rain here, except a drop or two—not large—about 2 o'clock.

2. On the Brighton Road, in Croydon, it rained sharply for two or three minutes, about 3 o'clock, or after, near the "Red Deer" (of rainfall, Dr. G. J. Hinde, 24, Avondale Road). Half a mile further north ("Swan and Sugarloaf") there was a heavy drenching.

3. Here thunder was heard with little intermission (but not a continuous roar, simply frequent peals), from 12.30 to 5.30 p.m. It was noticed that the lightning, extending from N.E. to N.W., and mainly W. of N., was remarkably vertical, evoking the comment that we were sure to hear of much damage in the morning.

4. Going outside at 3.30, a magnificent cloud pillar was noted from N.E. towards N., over the western end of Croham Hurst. It was estimated as rising to about 30° altitude, but rough measurements taken yesterday indicate that it may not have been more than 25°, and stretching over about 18° in azimuth. Billowy masses were constantly rising out of it with rapid changes.

Some of these, evidently more distant from us, were brilliantly lit up, but most, including the main mass, were dark and evidently in the shadow of a vast and very lofty canopy of cloud, the fringe of which was thin and bright. It reached back over the whole heavens, still with the appearance in the N.W. of a thunderstorm passing away. Below it from E. of the cloud pillar to nearly S. blue sky was visible, through haze and also, though much more obscured, on the north side. The cloud pillar rose rather higher and by 3.45 began to merge with the canopy above it, apparently inducing rain from that, which obscured the outlines.

Assuming that this cloud was the thunderstorm over Beckenham (Kent House Station, 6 miles off) and Lewisham (8 miles distant), and that the lower level was some quarter mile high, its summit must have risen fully three miles above the base.

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey, June 16th, 1914.

HEAVY SHORT PERIOD RAINFALL ON JULY 2nd.

THUNDER and rain commenced at 12.10 p.m. immediately accompanied with hurricane squall and hail. Lull at 12.15 when gauge was taken, giving ·54 ins., equal to 6·48 ins. per hour, thunderstorms and rain till night; rain early on July 3rd. Amount at 9.15 a.m. on July 3rd, 1·88 ins. (for month 2·48 in.). Old Howard funnel gauge gave 1·83 showing that Snowdon-Symons gauge retained the hail. Much damage was done by the squall at Ormesby station 7-8th of a mile west of this. Tree tops were taken off, a strong fence cleared of its rails, and two houses damaged and a chimney blown down. The path of extreme force of squall was only about 50 ft. wide. The air in this part contained floating branches of trees and leaves, temperature fell from 68° to 63°, but rose at once to 68°. Maximum in morning had been 78°. Morning was bright. Minimum July 3rd at 9.15 p.m. 53°, wind westerly. No hail 1¼ miles S.W. of this at Munthorpe, which stands about 150 ft. above this, which is 100 ft. above sea-level. On a steamer going its trial trip at the Teesmouth a gentleman (Mr. Lucas), was struck and stunned by a piece of ice which was measured, being 2½ by 1 inch.

W. STEWART TAILYOUR.

Ormesby, S.O., July 3rd, 1914.

THUNDERSTORMS AND CHANGES OF TEMPERATURE.

ON July 1st we had thunderstorms at about 8 a.m., 4.30 p.m., and near midnight. The one at 4.30 p.m. was very heavy and it came up from the south on a high wind with rain and hail and sand. The rain was torrential during about 20 minutes, and the fall during the storm amounted to 1¼ in. The rush of water through some of the streets was tremendous, and appears to have exceeded previous experiences. Extensive flooding and damage resulted in various districts. Between 3 and 4.30 p.m. the shade thermometer at 4 ft. fell from 88° to 67°.

Much colder weather followed the heat of June 30th and July 1st and on the morning of July 4th the minimum thermometer recorded 42°·8. An instrument on the grass must have fallen to within

a few degrees of the freezing point, as the night was very clear. There was quite a fog in the earlier hours, strikingly recalling the aspect of Nature on an Autumn morning.

W. F. DENNING, F.R.A.S.

Bristol, July 4th, 1914.

THE MAY FROSTS.

It may be of interest to your readers to know that in the district between the Hogs Back and Hindhead the frosts of May 26th and 27th destroyed many of the growing tops of bracken, only those in sheltered places being unaffected. Potato crops were also blackened, excepting in elevated parts on sandy soil. On my own ground (altitude about 410 ft.) they were unaffected. A neighbour had some frosted in the valley, while others higher up escaped, and I am informed that those on the sandy heights at Hale (about 600 ft.) escaped. Our own garden flowers and stone fruit crops were unaffected, including sweet peas and garden tropaeolums, nectarines and peaches. Of wild flowers I noticed that geranium lucidum had its leaves turned red as with autumn frosts. Young oak seedlings in exposed places also suffered, most of the larger trees escaping. Spanish chestnuts appear to have escaped injury. I saw no ash leaves frosted, but we have not many in this neighbourhood.

F. R. WALTERS.

Pinecroft, Farnham, Surrey, 19th June, 1914.

WEATHER ON JUNE 10th.

I should be extremely obliged if any of your readers (living at or near the following places, Stamford Hill, Enfield, Hertford, St. Albans, Hitchin, Luton, Woburn, Ampthill, Bedford, Wellingborough, Rothwell, Leicester, Derby, and Buxton), who observe and make notes of weather happenings, would send me notes of weather experienced form 7.30 a.m. until about 6 p.m. on Wednesday 10th June, and particularly regarding the behaviour of a detached cumulo-nimbus which passed in an apparently straight line from a point between Barnet and Enfield at 7.45 a.m. (then in an embryo state), in a N.N.W. direction, passing midway between St. Albans and Hertford, and Luton and Hitchin respectively, at a rate of about 20 miles per hour. According to press reports a violent hailstorm occurred along the path of this cloud, and since no other clouds of any significance were about immediately preceding the storm or during the day following (at least not in this vicinity) it should be comparatively easy to trace the history of this cloud, its growth from the initial stages, possibly south of the Thames, until it lost its activity and degraded, or lost its identity in the cloud mass in

connection with a depression situated over the western counties on that day, and where thunderstorms occurred during the afternoon. A. S. MARTIN-SMITH.

71, Wood Street, Barnet, Herts., 2nd July, 1914.

FALL OF TEMPERATURE.

THE remarkable drop in temperature between Wednesday and Friday last week as exemplified at our high level station, may be of interest. On Wednesday 1st inst., at 4 p.m., the dry bulb read 86°·8, the day's maximum of 87°·2 having occurred some half-hour previously. Exactly 48 hours later, at 4 p.m. on July 3rd, the dry bulb stood at 51°·9, this being 0°·1 above the minimum for the day, which occurred a little later, the thermometer thereafter rising to 53°·2 at 9 p.m. At 1 p.m. the reading was just over 63°, and the day's maximum was 64°·3. We thus get a difference of 34°·9 between the 4 p.m. readings of July 1st and 3rd.

We had 15 hours sunshine on 30th, the highest daily figure yet recorded at the Observatory (since 1910), and while the shaded maximum was 82°, the black bulb on 29th reached 136°·9, the highest but one we have yet observed. On the following day, with the screen maximum of 87°·2 the black bulb highest was 132°·3

ERIC L. HAWKE, F.R.Met.Soc.

2, Frognal Gardens, Hampstead, N.W., July 8th, 1914.

ARE ENGLISH THUNDERSTORMS MORE DANGEROUS THAN INDIAN?

THE sudden violent thunderstorms of June, 1914, were typical of conditions very common in England during the solstitial period May to July. Apart from the appalling storm of June 14th in south London, there was hardly a day during the first three weeks of the month when the newspapers did not contain melancholy reports of lightning casualties up and down the country. Sir John Moore, in his "Meteorology," lays great emphasis on the frequency and violence of English thunderstorms, in comparison with Irish and Scottish, and rightly so. But I want to ask readers who have been in India whether lightning casualties, nothwithstanding the severity of tropical storms, are not much rarer than with us. Many persons I have spoken to all agree that thunderstorms in England are more dangerous than in India. Is this a fact? and if so why? Do the discharges take place at a lower level with us? or is the accompanying rainfall less? Heavy rain, of course, tends to weaken the lightning It may be, however, that greater precautions against lightning are taken in tropical countries than in England, where storms are more irregular and unexpected. L. C. W. BONACINA.

July 1st, 1914.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

July 6th, 1911.

Starting Point.	Country.	A (Hc.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles.	F
Limerick.....	Ireland	7·5	—69	13·1	—58	35	E.N.E.
Petersfield	England ..	7·3	—81	10·6	—76	27	E.S.E.
Brussels	Belgium ..	8·1	—78	9·1	—70	12	S.S.W.
Lindenberg	Germany ..	6·7	—73	7·9	—63	36	S.S.W.
Paris	France ...	8·0	—87	10·5	—74	33	S.W.
Strassburg	Germany ..	7·9	—80	9·1	—76	40	S.S.W.
Munich	,, ..	8·0	—78	6·6	—67	39	S. by W.
Pavlovsk	Russia	6·8	—54	11·5	—51	48	S.S.W.
Nishni Olchedaeff	,, ..	6·1	—51	7·1	—47	24	N. by W.
Batavia	..	9·7	—120	10·2	—114	37	E.
Woodstock	Canada ..	8·7	—89	10·6	—81	44	N.E.

The pressure was very steady. An extensive high pressure area lay over Mid-Europe, with low pressure to the north and south. Except over Russia the temperatures are low for the summer. The return from Batavia, 6°, 11′ S., 106°, 50′ E., shows the usual low temperature prevailing at great altitudes in the tropics.

August 3rd, 1911.

Manchester	England ..	*7·2	—51	15·6	—53	73	E. by N.
Pyrton Hill	,, ..	7·5	—68	12·5	—62	73	N.E.
Brussels	Belgium ..	7·9	—76	9·6	—67	31	E. by N.
Lindenberg	Germany ..	7·0	—68	11·3	—51	7	S.W. by S.
Paris	France ..	7·9	—79	10·1	—62	72	E.
Strassburg.....	Germany ..	7·6	—69	8·3	—62	40	S.E. by E.
Munich	,, ..	7·9	—63	8·2	—62	39	S.S.E.
Pavia	Italy	7·5	—65	8·5	?	68	S.S.E.
Pavlovsk	Russia	7·9	—72	10·7	—53	36	E.S.E.
Nishni Olchedaeff	,, ..	5·9	—56	8·2	—51	28	N.W.by N.
Woodstock	Canada ..	8·1	—85	10·8	—80	58	N.E.

* Value indefinite.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

Anti-cyclones lay over Spain and Central Russia, and low pressure areas over the Balkans and in the North-West. Thunderstorms, occurred in Western Germany.

RAINFALL TABLE FOR JUNE, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	RAINFALL OF MONTH. 1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·28	1·15
Tenterden	*Kent*	51 4	*0 41	190	2·03	1·12
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·13	1·03
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·17	1·01
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	2·27	2·48
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	2·10	2·40
Shoeburyness	*Essex*	51 31	*0 48	13	1·77	·46
Bury St. Edmunds(Westley)	*Suffolk*	52 15	*0 40	226	2·21	1·19
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·77	1·27
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·18	2·32
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·18	2·27
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·43	2·55
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·59	2·02
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·52	2·44
Boston	*Lincolnshire*	52 58	0 1	11	1·95	2·57
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	2·06	2·09
Macclesfield	*Cheshire*	53 15	2 7	501	2·85	1·67
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	2·26	1·35
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·63	2·90
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·17	1·77
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·09	1·39
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·04	4·03
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·94	3·09
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·55	2·49
Haverfordwest	*Pembroke*	51 48	4 58	90	2·74	1·54
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·97	2·19
Llandudno	*Carnarvon*	53 20	3 50	72	1·97	2·18
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·84	·43
Marchmont House	*Berwick*	55 44	2 24	498	2·38	2·27
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·04	·84
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·41	...
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·64	2·23
Mull (Quinish)	,,	56 34	6 13	35	3·30	2·45
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·06	1·04
Braemar	*Aberdeen*	57 0	3 24	1114	2·18	1·77
Aberdeen (Cranford)	,,	57 8	2 7	120	2·02	1·09
Cawdor	*Nairn*	57 31	3 57	250	2·13	1·02
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·07	1·46
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·07	3·65
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·10	·87
Wick	*Caithness*	58 26	3 6	77	1·83	·84
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	2·92	1·72
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·79	1·19
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·70	·74
Ennistymon House	*Clare*	52 57	9 18	37	3·18	1·63
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·59	1·13
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·58	1·30
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·00	·88
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·72	1·11
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·17	·87
Cong (The Glebe)	,,	53 33	9 16	112	3·18	·75
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·11	1·24
Seaforde	*Down*	54 19	5 50	180	2·88	1·39
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·56	1·35
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·82	1·11

RAINFALL TABLE FOR JUNE, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
—1·13	50	·19	6	12	10·96	11·13	+ ·17	102	25·11	Camden Square
— ·91	55	·50	23	8	11·44	13·08	+1·64	114	27·64	Tenterden
—1·10	48	·71	23	6	12·46	14·13	+1·67	114	30·48	Patching
—1·16	47	·60	23	8	13·31	14·00	+ ·69	105	31·87	Cadland
+ ·21	109	·64	9	9	10·60	10·55	— ·05	100	24·58	Oxford
+ ·30	114	·95	8	10	11·14	8·95	—2·19	80	25·17	Croyland Abbey
—1·31	26	·25	6	6	8·00	7·98	— ·02	100	19·28	Shoeburyness
—1·02	54	·49	9	8	10·76	11·32	+ ·56	105	25·40	Westley
— ·50	72	·49	9	8	9·61	9·83	+ ·22	102	23·73	Geldeston
+ ·14	106	·75	20	12	15·88	20·55	+4·67	129	38·27	Polapit Tamar
+ ·09	104	1·04	14	10	14·33	15·37	+1·04	107	33·54	Rousdon
+ ·12	105	1·08	9	11	13·08	13·17	+ ·09	101	29·81	Stroud
— ·57	78	·83	9	9	14·30	12·22	—2·08	85	32·41	Wolstaston
— ·08	97	1·25	9	9	12·75	9·80	—2·95	77	28·98	Coventry
+ ·62	132	1·05	9	9	9·86	9·37	— ·49	95	23·35	Boston
+ ·03	101	·84	9	9	10·80	8·08	—2·72	75	24·46	Hodsock Priory
—1·18	59	·43	9	13	14·76	15·33	+ ·57	104	34·73	Macclesfield
— ·91	60	·54	9	11	12·96	11·00	—1·96	85	32·70	Southport
— ·73	80	1·35	9	11	27·22	28·18	+ ·96	104	61·49	Arncliffe
— ·40	82	·75	9	6	11·63	9·19	—2·44	79	26·87	Ribston Hall
— ·70	66	·41	9	9	11·08	8·34	—2·74	75	26·42	Hull
+1·99	198	1·51	9	11	11·55	11·41	— ·14	99	27·94	Newcastle
—3·85	45	·73	20	18	56·38	63·88	+7·50	113	129·48	Seathwaite
— ·06	98	1·06	9	12	17·22	20·68	+3·46	120	42·28	Cardiff
—1·20	56	·43	9	9	19·45	17·92	—1·53	92	46·81	Haverfordwest
— ·78	74	1·08	20	10	18·12	20·76	+2·64	114	45·46	Gogerddan
+ ·21	111	·89	11	10	12·37	12·24	— ·13	99	30·36	Llandudno
—2·41	15	·15	9, 20	6	19·06	21·81	+2·75	114	43·47	Cargen
— ·11	95	·57	21	9	14·38	12·61	—1·77	88	33·76	Marchmont
—2·20	28	·17	7	16	21·10	24·87	+3·77	118	49·77	Girvan
...	...	...	...	...	15·51	...	...	...	35·97	Glasgow
—1·41	61	·37	26	16	29·32	35·54	+6·22	121	68·67	Inveraray
— ·85	74	·42	19	16	23·55	25·53	+1·98	108	56·57	Quinish
—1·02	50	·60	18	11	12·02	10·85	—1·17	90	28·64	Dundee
— ·41	21	·87	21	12	15·15	16·87	+1·72	111	34·93	Braemar
— ·93	54	·43	18	12	14·02	11·56	—2·46	82	32·73	Aberdeen
—1·11	48	·31	4	4	12·51	11·63	— ·88	93	29·33	Cawdor
— ·61	71	·23	20	16	20·22	19·43	— ·79	96	44·53	Fort Augustus
— ·42	90	·77	5	14	37·55	46·22	+8·67	123	83·93	Bendamph
—1·23	41	·22	18	11	14·28	13·75	— ·53	96	31·90	Dunrobin Castle
— ·99	46	·16	4,8,21	15	12·71	11·88	— ·83	93	29·88	Wick
—1·20	59	·46	21	12	24·87	30·68	+5·81	123	54·81	Killarney
—1·60	43	·30	19	10	17·40	15·35	—2·05	88	39·57	Waterford
—1·96	27	·47	19	7	17·51	18·42	+ ·91	105	39·43	Castle Lough
—1·55	51	·38	30	13	19·67	23·66	+3·99	120	46·52	Ennistymon
—1·46	44	·58	20	8	15·42	14·26	—1·16	92	34·99	Courtown Ho.
—1·28	50	·40	19	11	15·84	15·58	— ·26	98	35·92	Abbey Leix
—1·12	44	·33	9	9	12·15	9·01	—3·14	74	27·68	Dublin
—1·61	41	·45	19	9	16·01	15·77	— ·24	98	36·15	Mullingar
—2·30	28	·26	19	11	23·38	25·45	+2·07	109	52·87	Enniscoe
—2·43	24	·20	7	10	21·41	24·23	+2·82	113	48·90	Cong
—1·87	40	·23	7	13	18·83	20·49	+1·66	109	42·71	Markree
—1·49	48	·58	20	10	17·42	15·14	—2·28	87	38·91	Seaforde
—1·21	53	·34	22	12	15·49	15·99	+ ·50	103	37·56	Dundarave
—1·71	39	·25	19	13	17·10	18·69	+1·59	109	39·38	Omagh

SUPPLEMENTARY RAINFALL, JUNE, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	1·20	XI.	Lligwy	·78
,,	Ramsgate.....	1·24	,,	Douglas	·94
,,	Hailsham	1·39	XII.	Stoneykirk, Ardwell House...	·77
,,	Totland Bay, Aston House...	·84	,,	Dalry, The Old Garroch.....	·83
,,	Stockbridge, Ashley..	·26	,,	Beattock, Kinnelhead	1·21
,,	Grayshott	1·08	,,	Langholm, Drove Road	...
III.	Harrow Weald, Hill House...	1·52	XIII.	Meggat Water, Cramilt Lodge	2·28
,,	Caversham, Rectory Road ...	1·24	,,	North Berwick Reservoir.....	1·05
,,	Pitsford, Sedgebrook.....	2·79	,,	Edinburgh, Royal Observaty.	1·00
,,	Woburn, Milton Bryant.....	2·60	XIV.	Maybole, Knockdon Farm ...	·88
,,	Chatteris, The Priory..... ...	2·16	XV.	Ballachulish House	...
IV.	Elsenham, Gaunts End	2·35	,,	Campbeltown, Witchburn ..	1·83
,,	Colchester, Hill Ho., Lexden	1·08	,,	Holy Loch, Ardnadam.....	...
,,	Ipswich, Rookwood, Copdock	·69	,,	Islay, Eallabus	...
,,	Blakeney.....	2·69	,,	Tiree, Cornaigmore	1·57
,,	Swaffham	2·07	XVI.	Dollar Academy	·71
V.	Bishops Cannings	1·82	,,	Balquhidder, Stronvar.....	...
,,	Wimborne, St. John's Hill...	1·67	,,	Glenlyon, Meggernie Castle..	1·81
,,	Ashburton, Druid House.. ...	1·52	,,	Blair Atholl	1·18
,,	Cullompton	1·95	,,	Coupar Angus	·94
,,	Lynmouth, Rock House	2·49	,,	Montrose, Sunnyside Asylum.	·95
,,	Okehampton, Oaklands.....	2·10	XVII.	Alford, Lynturk Manse	1·63
,,	Hartland Abbey.....	1·93	,,	Fyvie Castle	·82
,,	Probus, Lamellyn.....	1·89	,,	Keith Station	1·76
,,	North Cadbury Rectory.....	2·22	XVIII.	Rothiemurchus	...
VI.	Clifton, Pembroke Road.....	2·56	,,	Loch Quoich, Loan	7·50
,,	Ross, The Graig	3·17	,,	Drumnadrochit..... ...	1·04
,,	Shifnal, Hatton Grange.....	3·62	,,	Skye, Dunvegan	3·41
,,	Droitwich.....	2·15	,,	Lochmaddy Bayhead	1·94
,,	Blockley, Upton Wold.....	4·06	,,	Glencarron Lodge	4·11
VII.	Market Overton.....	...	XIX.	Invershin	1·22
,,	Market Rasen	2·13	,,	Melvich	2·03
,,	Bawtry, Hesley Hall	1·25	,,	Loch Stack, Ardchullin	3·82
,,	Derby, Midland Railway.....	1·84	XX.	Skibbereen Rectory	1·98
,,	Buxton	2·45	,,	Dunmanway, The Rectory ..	1·67
VIII.	Nantwich, Dorfold Hall	1·47	,,	Glanmire, Lota Lodge, No. 1	·84
,,	Chatburn, Middlewood	1·90	,,	Mitchelstown Castle.....	1·56
,,	Cartmel, Flookburgh	1·20	,,	Darrynane Abbey.....	1·80
IX.	Langsett Moor, Up. Midhope	3·69	,,	Clonmel, Bruce Villa	·90
,,	Scarborough, Scalby	1·99	,,	Newmarket-on-Fergus, Fenloe	·84
,,	Ingleby Greenhow	4·71	XXI.	Laragh, Glendalough	1·81
,,	Mickleton	2·60	,,	Ballycumber, Moorock Lodge	·76
X.	Bellingham, High Green Manor	2·46	,,	Balbriggan, Ardgillan	1·38
,,	Ilderton, Lilburn Cottage ...	3·80	XXII.	Woodlawn	1·46
,,	Keswick, The Bank.....	1·55	,,	Westport, St. Helens	1·20
XI.	Llanfrechfa Grange	2·81	,,	Dugort, Slievemore Hotel ...	2·50
,,	Treherbert, Tyn-y-waun	2·71	,,	Mohill Rectory	1·99
,,	Carmarthen, The Friary	1·74	XXIII.	Enniskillen, Portora.....	1·10
,,	Castle Malgwyn [Llechryd]...	1·52	,,	Dartrey [Cootehill]	1·48
,,	Crickhowell, Tal-y-maes.....	3·80	,,	Warrenpoint, Manor House ..	1·39
,,	New Radnor, Ednol	2·61	,,	Banbridge, Milltown	1·59
,,	Birmingham WW., Tyrmynydd	2·19	,,	Belfast, Cave Hill Road	1·52
,,	Lake Vyrnwy	...	,,	Glenarm Castle..... ...	1·33
,,	Llangyhanfal, Plâs Draw.....	3·90	,,	Londonderry, Creggan Res...	1·97
,,	Dolgelly, Bryntirion.....	2·32	,,	Dunfanaghy, Horn Head ...	1·38
,,	Bettws-y-Coed, Tyn-y-bryn...	3·57		Killybegs	2·33

METEOROLOGICAL NOTES ON JUNE, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Beautiful sunny and warm weather generally with occasional light R. The duration of sunshine 236·6* hours, was the greatest amount since August, 1911. Duration of R, 17·6 hours. Mean temp. 62°·4, or 2°·3 above, the average. Evaporation 2·93 in. Shade max. 89°·0 on 30th; min. 41°·5 on 8th. F 0, f 0.

TENTERDEN.—Mostly cold and dull till after 9th. Showery from 6th to 9th and a good R on 23rd, otherwise very dry. Duration of sunshine 265·0† hours. Shade max. 81°·0 on 30th; min. 40°·0 on 9th. F 0, f 0.

TOTLAND BAY.—Duration of sunshine 274·5* hours, the brightest June since 1908. Shade max. 76°·0 on 30th; min. 41°·1 on 8th. F 0, f 0.

MILTON BRYAN.—A lovely month. The hot sun after rains dried the ground too quickly. Over ·50 in. of R fell in about 20 minutes on 8th

IPSWICH, COPDOCK.—A very dry month. The absence of R is being seriously felt. Duration of sunshine 245·2* hours and the highest for June in 12 years. Mean temp. 58°·1. Shade max. 82°·2 on 30th; min. 37°·5 on 8th. F 0, f 2.

ROUSDON.—On 14th T was heard over Portland Bill at 2 p.m. and a TS passed down Channel with much L followed by a fiercer storm about 4 p.m. T and L became incessant, and at 7.45 p.m. were coincident showing the storm to be close over this station. It passed over by 9 p.m.

MACCLESFIELD.—A grand sunny month. Most of the R fell in the early mornings and was followed by beautiful sunny days. Shade max. 82° on 30th.

SOUTHPORT.—Duration of sunshine 234·2* hours, or 23·4 hours above, average. Duration of R 29·1 hours. Evaporation 3·25 in. Mean temp. 57°·6, or 0°·9 above, average Shade max. 76°·0 on 15th; min. 41°·0 on 8th. F 0, f 0.

HULL.—Cloudy days up to 10th with squally winds and showers, then a fine dry period to the end broken only by T showers on 20th and 22nd. Duration of sunshine 156·2* hours. Shade max. 89°·0 on 30th; min. 39°·0 on 3rd. F 0, f 1.

HAVERFORDWEST.—Duration of sunshine 255·5* hours. Shade max. 73°·7 on 29th; min. 40°·0 on 27th. F 0, f 0.

BETTWS-Y-COED.—Wet from 7th to 11th, otherwise a fine month with temp. about the average. Shade max. 76°·0 on 30th; min. 39°·0 on 1st. F 0, f 0.

MARCHMONT.—Duration of sunshine 252·6* hours on 27 days.

EDINBURGH.—Shade max, 74°·0 on 30th; min. 39°·8 on 1st. F 0, f 0.

COUPAR ANGUS.—R about half the average. Mean temp. 57°·8 was unusually high.

DRUMNADROCHIT.—R 1·24 in. below the average. Low temp. and continuance of winds from northern semi-circle. Vegetation injured by drought.

LOCH STACK.—Duration of sunshine 165·3* hours.

DUNMANWAY.—A fine and warm month. On 21st ·50 in. of R fell in about 20 minutes at 4 p.m.

DUBLIN.—A fine dry month with a preponderance of winds from N.W. to N.E. Temp. was distinctly low in the first half of month, but the last few days days were warm. Mean temp. 57°·9, or 0°·5 above, average. Shade max. 76°·0 on 30th; min. 42°·8 on 1st. F 0, f 0.

OMAGH.—A fine dry month. All crops suffering from want of R. Hay crop very light. Shade max. 77°·0 on 15th; min. 40°·0 on 20th.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, January, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	55°6	9	20°9	24	42°4	33°7	35°5	88	76°9	18°6	·55	12	7·6
Malta	66·6	17	44·0	8, 24	57·4	46·8	...	74	124·0	.	3·83	16	2·3
Lagos	90·2	28, 31	71·0	14†	87·9	75·6	72·9	75	146·2	67·0	1·57	3	6·0
Cape Town	92·7	25	51·7	4	77·0	60·4	57·1	67	...	...	2·42	6	2·7
Natal, Durban ...	82·0	18, 22	63·0	10	77·4	70·0	68·5	76	...	...	3·06	13	7·0
Johannesburg	86·9	30	47·2	26	80·4	58·2	54·4	67	155·0	44·8	2·71	11	4·3
Mauritius	89·1	3, 11	68·3	2	85·9	72 4	70·3	76	159·8	63·5	6·00	21	7·9
Bloemfontein ...	97·9	3	56·5	23	90·8	63·3	58·4	59	...	...	2·38	11	1·8
Calcutta...	83·5	31	51·1	12, 13	77·7	56·2	56·8	71	...	44·7	·00	0	3·0
Bombay...	87·3	9	65·3	28	84·3	69·7	65·2	68	136·0	58·7	·00	0	1·5
Madras	84·8	29	63·4	27	83·6	67·9	65·4	72	150·0	59·4	1·06	2	2·9
Colombo, Ceylon ...	90·8	27	70·9	10, 15	88·2	72·3	70·6	75	166·1	64·7	·19	4	4·5
Hongkong	76·9	14	47·4	1	67·4	58·8	52·7	69	...	...	·00	0	3·9
Sydney	95·4	27	58·1	21	80·9	65·2	58·0	58	155·0	49·3	·66	9	5·3
Melbourne	97·9	7	47·2	28	78·0	56·1	50·8	55	159·1	43·1	1·45	6	3·5
Adelaide	102·7	24	53·4	14	83·7	59·5	51·4	48	164·9	44·2	1·07	5	3·0
Perth	102·3	28	54·0	9	86·7	63·6	56·0	51	177·3	50·3	·04	1	2·0
Coolgardie	107·8	17	53·0	12	94·2	63·2	50·1	33	183·8	51·4	·29	3	1·6
Hobart, Tasmania	88·0	25	45·7	20	70·6	52·9	46·4	54	147·0	39·9	·24	10	6·2
Wellington ...	79·6	30	48·6	15	71·2	59·0	55·1	70	150·6	35·0	2·60	11	7·0
Auckland	79·5	15	52·0	11	74·8	59·6	58·6	74	153·0	48·0	1·32	6	4·9
Jamaica, Kingston ..	89·4	10	63·9	29	86·9	68·8	65·0	78	...	...	·14	2	4·1
Grenada	85·0	12*	69·0	15, 28	83·4	72·8	...	73	136·0	...	1·80	15	2·0
Toronto	54·3	29	-22·0	13	33·3	17·8	20·5	87	86·4	-23·3	3·44	16	8·2
Fredericton	45·0	30	-24·0	18	21·8	-0·1	...	85	...	...	4·56	14	5·5
St. John, N.B. ...	46·7	30	-9·5	14	26·1	9·6	13·0	76	..	...	2·87	18	5·4
Edmonton, Alberta ...	42·9	5	-28·7	24	16·1	-0·8	...	92	75·2	-33·8	·64	10	6·3
Victoria, B.C.	52·2	11	28·0	28	45·5	38·7	38·0	87	...	...	8·47	27	8·3

* 13 and 14. † 15 and 22.

Johannesburg.—Bright sunshine 266·6 hours.

Mauritius.—Mean temp. of air 0°·1 below, dew point normal, and R 1·61 in. below, averages. Mean hourly velocity of wind 9·6 miles, or 1·5 below average.

Bloemfontein.—The hottest January on record here, 77°·1. R below average, with dry wind and dust.

COLOMBO.—Mean temp. of air 80°·2, or 1°·3 above, of dew point 0°·7 above, and R 3·34 in. below, averages. Mean velocity of wind 6·6 miles per hour. TSS on three days.

HONGKONG.—Mean temp. of air 62°·8. Mean hourly velocity of wind 13·4 miles. Sunshine 240 hours, the most on record, and the first January without R since 1884.

Melbourne.—Mean temp. of air 0°·4 below, and R ·37 in. below, averages.

Adelaide.—Mean temp. of air 2°·5 below, and R ·34 in. above, averages.

Coolgardie.—Temp. of air 1°·3 above, and R slightly below, averages.

Hobart.—Temp. of air 0°·7 below, and R 92 per cent. below, averages.

Wellington.—Mean temp. of air 1°·8 above, and R ·71 in. below, averages.

Auckland.—R less than half and mean temp. above averages.

Symons's
Meteorological Magazine.

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"BRITISH RAINFALL, 1913."

The fifty-third annual volume of "British Rainfall" is already in the hands of subscribers, having been published at an earlier date than in any year since 1902. Despite efforts to restrict the expansion of the volume so as to reduce, within reasonable limits, the apparently inevitable annual deficit, it continues to grow in size, containing 476 pages against 468 last year.

The book, which is compiled under the direction of Dr. Mill by Mr. Salter and Mr. Mossman, opens with the Report of the Director to the Trustees of the British Rainfall Organization. Reference is made to the great loss sustained by the Organization in the death of Sir John Murray, who represented Scotland on the Board of Trustees, and who for many years took a great interest in the whole work carried on at Camden Square. The continued expansion of the Organization in all its branches has led to an application to the "Development Fund" for assistance in order that the large volume of records may be adequately discussed with special reference to agriculture, and in other utilitarian directions which the limited income available at present renders impossible. Dr. Mill points out that it is the continued and unchecked expansion of the work in all its aspects that has led to this request.

The routine work carried on at Camden Square has continued on the same lines as formerly. The total number of records appearing in *British Rainfall*, 1913, shows a net increase of 98 over the previous year, amounting to 5370. Complete daily records were received from 3370 stations, and less complete daily returns from 364 others.

Since last October, owing to a temporary breakdown in the health of the Director, his duties were carried on by Mr. Salter and Mr. R. C. Mossman. Despite the difficulties occasioned by the Director's unavoidable absence, the work has proceeded without a hitch, a result largely due to Mr. Salter's thorough knowledge of the workings of the British Rainfall Organization and the efficient and whole-hearted manner in which he was supported by the other members of the staff. In recognition of these services to the Organization, the Trustees have appointed Mr. Carle Salter Assistant-Director, while Mr. H. E. Carter has been appointed Chief Computer, and Mr. D. S. Salter, Cartographer.

The general treatment of the data continues on the same lines as formerly. There are three special articles, the first being an appreciation of the late Sir John Murray, by Dr. Mill, and the others by Mr. Mossman, one on the July and August drought of 1913, the other on heavy rains in short periods from 1868 to 1913. As in the last few years, the entire responsibility for the production of Part III. rested with Mr. Salter, who also compiled a considerable portion of Parts I. and II., in which he was assisted by Mr. Mossman.

The volume is, as usual, fully illustrated by maps. Two of these are printed in colour, one representing the variation of the local rainfall in the British Isles during 1913 from the average, the other depicting the heavy fall of rain near Doncaster on September 17th, 1913.

THE RENEWAL OF ANTARCTIC EXPLORATION AND RESEARCH.

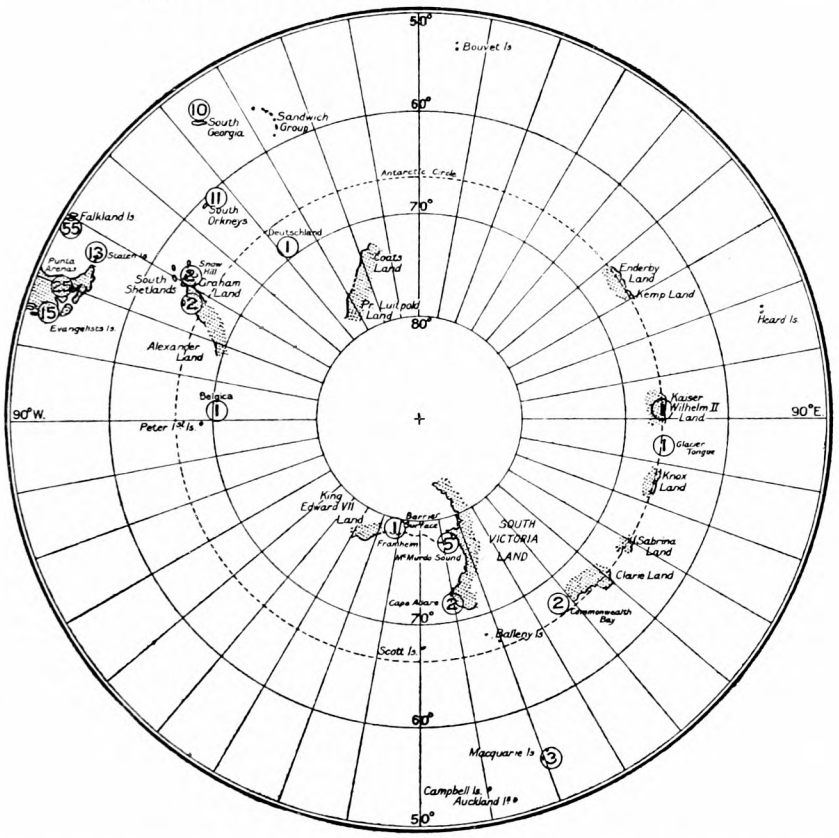
By R. C. Mossman, F.R.S.E.

Although from a popular standpoint the attainment of the South Pole marked the culminating point of recent Antarctic research, it is only now that specialists are beginning to perceive the many problems of both practical and theoretical interest that the Antarctic campaign, prosecuted so vigorously during the last 15 years, has opened out. This increase of interest is well shown by the circumstance that the plans of four well equipped Expeditions, differing markedly from each other in their aims and objects, have been before the public for some time. Of these the most important, from both a geographical and a popular point of view, is that of Sir Ernest Shackleton's Imperial Trans-Antarctic Expedition which so recently left our shores. This Expedition has been fitted out not only with the primary object of re-establishing British prestige in Polar fields, but of making observations covering all branches of Physical Science at two base stations some 1600 miles apart. During a portion of this time the main body of explorers under Sir Ernest himself, will, as far as circumstances permit, be conducting similar observations over the Antarctic Sahara, on their great march from the Weddell to the Ross Sea, and further subsidiary sledge expeditions from both bases will be likewise engaged making important geological and other investigations. Of the three other expeditions which will shortly set out the Austrian will, in the main, be devoted largely to research in the Weddell Sea area on somewhat the same lines as the Shackleton Expedition, minus the trans-antarctic journey. It is obvious that if this Expedition has the good fortune to set up winter quarters in the Weddell Sea that its results in every department of science will enhance and be enhanced by the neighbouring British Expedition. Mr. Stackhouses' Expedition, which is expected to leave these shores about the end of the year, will be devoted mainly

to oceanographical and biological studies over the great southern oceans up to the highest latitudes. Exceedingly valuable results are to be expected from hydrographical and biological research over such an extended period as is contemplated by the leader of this Expedition.

The Anglo-Swedish Antarctic Expedition, under Dr. Otto Nordenskjöld, is expected to leave Europe in August next year, and to carry on general scientific investigations for at least four or

METEOROLOGICAL RECORDS IN SOUTH POLAR REGIONS.



five years on the coasts of the South Shetlands and Graham Land, from a fixed station to be established on the east coast of the latter country. It is hoped that among other debated questions which this Expedition will solve is that of the connection between West Antarctica, Graham Land, and its environs, on the one hand, and that of the " true Antarctic Continent " on the other. It will thus be seen that the next few years should witness a great increase in our general knowledge of Antarctica, and the present seems an

opportune moment to draw attention to the present position of meteorology in high southern latitudes. To illustrate some of the points we shall briefly comment on the map of the South Polar regions south of lat. 50° S., which has been prepared. The position of stations where meteorological (and in most cases magnetical and physical) observations have been made is indicated by a ring, and a figure inside the ring shows the number of years over which the observations extend. Dealing first with the area to the south of 60° S., it will be seen that we possess data covering a combined period of 29 years from 11 stations, one of which, viz., the Argentine Station at the S. Orkneys has been carried on without interruption since March, 1903, thus furnishing nearly one-third of the whole observations.

The only other locality with more than two years observations is in McMurdo Sound, where data covering five years are available. Of this material Captain Scott's two expeditions supplied four years' results, and Sir Ernest Shackleton's one year's. Subsidiary data in this region are afforded by two years' observations from C. Adare, and a year's observations on the Ross Ice Barrier to the east where Amundsen set up his winter station.

On the Atlantic side the long S. Orkney record is supplemented by the observations taken on Filchner's Expedition, as well as by observations, nearly all simultaneous, taken by Nordenskjöld, Charcot, and at S. Georgia, the Falkland Islands, and several stations at the extremity of the S. American continent, only a few of which are indicated on the map owing to its being on too small a scale to mark the position of the stations belonging to the Argentine and Chilian Weather Services. The data refer to results accruing from fixed observatories, except in two instances, where the Antarctic Research ship was frozen up in the ice. This happened in the case of the "Belgica" in 1898-99, and again in 1912 when the "Deutschland" was beset in the Weddell Sea, and drifted about in the ice between the months of March and November. The mean position of the ship has been indicated in these specific cases. It will be seen that the only areas which afford material sufficient to give even an approximation to a true knowledge of the meteorology of the circum-polar regions are situated to the south and south-east of the S. American continent on the one hand, and almost due south of Australia on the other, the longitudes embraced by the records being from 90° to 30° W., and from 168° W. to 143° E.

Data are also available for a small area situated on the Antarctic circle to the east and west of the 90th meridian of E. longitude, where Sir D. Mawson had his western base, near where the "Gauss" Expedition wintered in 1902. To put it briefly, only over one-third of the S. Polar area south of 60° S., and extending in one instance only as far as 78° 30° S., have we even a general knowledge of the

climatic features throughout the year. Of course there is a considerable mass of data relating to summer conditions, derived from cruises made in other areas during this season, and there are similar data available from various sledge journeys made from the main base of several expeditions, but this information is necessarily somewhat scanty and only enables us to obtain glimpses of the climatic conditions of the regions involved, over a very limited portion of the year.

It will thus be seen from this brief reference that the material available for the investigation of Antarctic climate is all too scanty, and that many years must necessarily elapse before sufficient data are accumulated to enable us to give a picture of the normal conditions. For this reason it is a matter for congratulation that in the near future we may look forward to a substantial addition to our knowledge of the meteorology of the South Polar regions.

WEATHER IN THE SEVENTEENTH CENTURY (LAST QUARTER).

By Walter Sedgwick.

I.—Spring and Summer to end of July.

In Volume 46 of this Magazine the weather in the Seventeenth Century was considered in a series of articles based on the observations recorded in the diaries of two contemporaries, John Evelyn, F.R.S., and Samuel Pepys, F.R.S. Pepys diary deals with the years 1660 to1669. Evelyn's diary extends over the whole period of his life, 1620 to 1706, but his notes on weather are most frequent during the last 25 years, *i.e.*, 1681 to 1706.

It is now proposed to consider the weather during the last quarter of the same century from information given by a contemporary diarist living in another part of England. This diarist was the Rev. Wm. Samson, Rector of Clayworth, Notts., who from 1676 until his death in 1701 kept a parish record called " The Rector's Book," in which besides noting local events he entered many observations on the weather and the condition of crops. His entries were transcribed and edited in 1910, and the extracts given in this series of articles are taken from that edition.

Clayworth is a small village in the north of Nottinghamshire, about six miles west of Gainsboro, and eleven miles north-east of Worksop. The village lies near the River Idle, a tributary of the Trent, at a height of only about 50 ft. above sea level. The surrounding country is generally low lying, but on the north, east and south-east the ground rises gradually to a height of about 150 ft. above sea level, and at one point to a maximum of 255 ft. The

village is situated in a very dry area with an annual rainfall of 25 inches or less.

It is proposed to divide the weather observations in the Rector's Book into three parts viz.—(I.)—Spring and Summer to the end of July. (II.)—Harvest and Autumn. (III.)—Winter. This article deals with the first named period, *i.e.*, March 25th, O.S., the beginning of the year under the Julian Calendar, to July 21st, O.S. (April 4th to July 31st N.S.). When comparing the weather described in the Rector's Book with the weather of to-day allowance must be made for the change in the calendar fron the Old Style to the New Style. This change was fully explained in the former series of articles (See Vol. 46, p. 63), where it was shown that the present or Gregorian calendar is in advance of the old or Julian calendar by ten days, as regards the Seventeenth Century, and eleven days as regards the Eighteenth Century up to 1752, when the New Style was adopted in England. The difference is roughly a third of a month, and in considering the extracts given at the end of this article this difference must be borne in mind.

It cannot be claimed that the observations made by Mr. Samson upon the weather of his time give any certain and definite idea of the character of the weather during the quarter of a century which his record covers, nevertheless his observations are of some interest, in that they point to the weather conditions then being not unlike those of the present time. In fact so far as Mr. Samson's observations go, it would appear that there is great similarity between the weather at the beginning of the 20th Century in England and that at the end of the 17th Century. It is obvious that in Mr. Samson's lifetime the springs and summers were uniformly warm and genial, but showed considerable variations in different years. In springtime there were, it is true, many warm spells, but there were also many spells of severe weather, cold winds and snow, even as late as the middle of May. The picturesque expression " snow up to the shoe tops " occurs in more than one April. There were many Mays when the " Ice Saints " nipped the fruit trees, and in 1693 the fruit was apparently seriously damaged by cold winds as late as June.

The rather frequent occurrence of floods recorded by Mr. Samson even in spring and summer is perhaps at first sight surprising, having regard to the low average rainfall of this area at the present time. There is, however, a natural liability to floods in the neighbourhood of Clayworth, owing to its general elevation being very little above sea level, and as this liability depends not only on the rainfall but on the care taken in keeping cuts and outfalls cleaned, the more frequent occurrence of floods in the seventeenth century than now would not necessarily imply a change in the average annual rainfall.

There are some indications in the Rector's Book of short term variations in the climate. For instance, there are three severe

droughts recorded during the six years 1681 to 1686, and another very dry summer in 1690, but there are no long droughts referred to in the remaining eleven years. As far as it is possible to judge, it seems that the springs and summers in the decade 1691 to 1700 were on the whole, wetter than those in the previous decade 1681 to 1690. Then again all the records of severe spring weather occur in the latter portion of the period covered by this book. Up to the year 1687 there is no note made of cold weather in April of May, whereas after 1686 entries of cold spring weather are made almost every year. Snow is recorded in April (N.S.) in 1688, (13th) 1689, (6th) 1692, and 1695 (9th), and in the year 1698 he records as late as the 13th May that " snow fell and lay all day." The years when the advent of spring was latest were 1695 and 1698, but the worst summer in this period was probably that of 1692, which is also noted by Evelyn as exceedingly bad throughout.

When the weather observations in the Rector's Book are compared with those in Evelyn's diary, there is found to be a remarkable similarity considering that one set of observations relate to the north of Nottinghamshire and the other to the neighbourhood of London. This will be seen in the following table :—

Year.	*Rector's Book.*	*Evelyn's Diary.*
1681.	Severe drought	Severe drought and cold spring
1682.	Very wet from mid-April to mid-May	Mid-April a very wet season
1683.	March dry, end of April wet	March hot and dry, April wet
1684.	Very severe drought	Late spring,then hot,very severe drought
1685.	Plague of caterpillars	Very severe drought, plague of caterpillars
1689.	April first week cold and snow, middle of May severe frosts	One of the most seasonable Springs free from the usual sharp east winds
1692.	Very wet	Very cold Spring, very wet summer
1693.	April wet	April wet
1695.	Cold and late Spring	Cold and late Spring
1696.	May to July wet	Summer wet and cold
1698.	May cold and snowy	May cold and snowy
1699.	June weeks alternating wet and dry	June excessively hot
1700.	Variable	Spring genial, June fine
1701.	Backward Spring	Early Spring dry

The only occasion when there is a very noticeable divergence between the notes of the two Observers is in the spring of 1689. The divergence may be due to a real difference in the weather of that spring between London and Nottingham, or possibly to the fact that there was a fine period between the two spells of cold recorded by

the Rector. Evelyn's observation is dated 21st April (O.S.), the Rector's 27th March and middle of May.

NOTE.—In the following extracts the dates in the margin are all New Style and the dates given in the extracts have been corrected to New Style, except in cases where the extracts are under the heading "Seasons." In these cases it has been found more convenient not to depart from the language of the diary, but where possible the corresponding dates in New Style are given in brackets.

Dates, New Style.

1676. June 21 Hay time began.

1677. May 11 A very sore stormy rainy day (Mayday, O.S.)
Seasons.—It was very wet in May and June.

1678. July 11 Hay-sil began (*i.e.* hay harvest).

1679. July 3 Hay time began.

1680. June 1 Waters overflow the Carre and Common

1681. *Seasons.*—It was a very dry and droughty year from the beginning of April to the 20th June (30th), having not rained, except on the 7th May (17th), between these two times. . . . . It was also a very waspy year.

1682. *Seasons.*—From the middle of April to the middle of May it was very wet, the meadows were generally drowned. . . . . and great fears of scarcity of fodder. But the weather taking up there was more than ordinary plenty.

1683. *Seasons.*—At end of March was great drought by means whereof abundance of green lice covered the buds of apple trees. . . . . The latter end of April was dropping, about the midst of May wet weather.

1684. *Seasons.*—In the beginning of April green mites observed on apple tree buds . . . . In the declension of June clocks or locusts great store upon trees. Very droughty all the spring and up to the 28th July (August 7th).

1685. *Seasons.*—It was a sore year of caterpillars which, with ill blasts, destroyed all our hopes of apples.

1686. *Seasons.*—In May a great flood.

1687. *Seasons.*—The Spring was fair and forward, but then in April very sharp and severe, so that young pigeons were everywhere found to die, one or both in their nests, the old ones not finding food to feed them. About Mayday (11th), droughty and dry, and about the 8th (18th) day came steeping rains.

1688. April 13 Snow up to the shoetops.
May 9 Very much rain.
May 13 Very much rain.

1689. *Seasons.*—The year began (*i.e.* April 4th N.S.) with cold and wet; the 27th March (April 6th), was snow to the shoetops. About the midst of May were three or four frosty nights which blasted most fruits and cut chops in apples to the very core.

1690.		*Seasons.*—At the latter end of April rains fell after a drought of two months. On the 30th May (9th June), all was dry at Parson Hern. The beginning of July was very dry and droughty.
1691.		*Seasons.*—The Spring was forward, rains in June which made a bad haytime.
1692.		*Seasons.*—The end of March and beginning of April was stormy, wind, rain, and snow; so was also the latter end of April from the 24th day (May 4th). In May the rains hindered our processioning and winds in the latter end of the month were violent and blasting and cut off a great deal of young fruit. From Midsummer to the end of June rains put out the waters . . . . the ways not being passable. In July rains again from 12th to 17th (22nd to 27th).
1693.		*Seasons.*—April showery and at later end very wet. June. A blast upon the setting of fruit. July 16th (26th) rained sorely.
1694.	April	9th, a soaking rain after a long drought; 13th, windy; 18th, showery; 20th, windy; 30th, very hot
	May	11th, rains after three weeks drought; 21st, dewy; 29th, turned to fair weather.
	June	28th, thunder and lightening in the evening.
	July	16th, very hot weather; 19th to 21st, very windy; 29th, rains after long drought.
1695.	April	9th, snow to the shoetops; 15th, wind N.E. from the beginning of the month; 24th, turns to rain.
	May	1st, wet weather; 17th, a sere wind from the north.
	June	1st, a backward Spring; not hitherto one hot day; 30th, rain after a long drought.
	July	28th, thunder with lightnings and rain.
1696.	April	6th, sharp east winds continue.
	May	9th, dropping; 12th, high winds; 17th, rain from noon to night; 27th, rain all day.
	June	12th, storm of rain; 15th, a sore rainy day. We went not this year in procession (in Rogation week) . . . . . the way was so foul and weather ill.
	July	4th, very rainy these two or three days.
1697.		*Seasons.*—Fruit much blasted by May winds.
1698.		*Seasons.*—What remained of March (*i.e.* April 4th to 10th N.S.), calm and warm. April windy as if it had been March.
	May	1st, snow all afternoon; 13th, snow fell and lay all day.
	June	10th, rain prevented our processioning. *Seasons.*—June. The Spring backward by sharp winds.
	July	21st, 22nd, and 25th, rayns.
1699.		*Seasons.*—March. From the 25th to the end of the month (April 4th to 10th), dropping weather. April 1st to 14th (11th to 24th), wind N.E. By 23rd (May 3rd), ground dry and so continues to the month's end (May 10th). On the 4th (14th) May, fell rain, but by the 19th (29th), a very

		dry time which caused green clocks (resembling wevels) to abound and harm the fruit. June, the weeks alternating, wet and dry.
1700.	April	12th, cold winds,; 15th, stormy; 27th , showery.
	May	8th, thunder and lightning; 22nd, much rain.
	June	9th, much thunder with lightning and rain; 24th, rain after long drought.
	July	8th, rainy; 16th, a very great shower; 20th, good hay weather.
1701.	April	6th, a mild day; 16th, sharp wind; 20th, fine and calm; 25th, sharp wind.
	May	9th, a very backward Spring.
	May	25th, some sprinklings after a fortnight's drought; 28th, rains follow.
	June	20th, showery; 24th, thundering and rain.
	July	3rd, thunder and rain; 8th, hot weather; 20th, great rain in the afternoon.

THE WEATHER OF JULY.

THE month opened with very hot weather, the shade thermometer on the 1st rising to 94° at Camden Square, 92° at Greenwich, and 90° at Wisley (Surrey) In the north and west of Scotland and in some parts of Ireland, on the other hand, cool weather prevailed, with maxima in many cases under 65°. The high temperatures were associated with falling pressure over the United Kingdom, and regions surrounding, with heavy thunderstorms over a large part of England. Heavy rain fell at many places, about 2 inches being recorded at York, Harrogate, Bradford, and Claverley on the 1st, and a similar quantity at Shrewsbury on the 2nd, when temperature fell considerably. On the 4th when a large depression was approaching from the Atlantic, a southerly gale was experienced at Malin Head, but calm weather, with rather low temperatures occurred in some parts of Scotland, the shade thermometer on this day falling as low as 30° at West Linton, the next lowest in Scotland being readings of 38° recorded at many scattered localities all over the country, and at Markree Castle in the west of Ireland. In England the lowest readings were 36° at Newton Rigg and 37° at Marlborough and Llangammarch Wells. From about the 5th to the 8th a depression of no great depth lay over the Kingdom, causing rainy conditions in most districts, but the falls were in no instances considerable. On the 8th thunderstorms occurred in a few of the Midland Counties and in the north of England. On the 11th temperature fell to 37° at West Linton when Scotland was within the limits of an anti-cyclonic system, the centre of which lay between the Faeroe and the Norwegian coasts. After the 11th until quite the close of the month, conditions over our Islands were determined

THAMES VALLEY RAINFALL. ——— JULY, 1914.

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting.
Isohyetals.

by a series of shallow depressions which spread in from the Atlantic. Mist or fog was very prevalent, especially on coastal regions; temerature was in general above the average, this being largely due to the high night values. Thunderstorms were comparatively frequent over a wide area, and on some occasions were associated with heavy falls of rain. On the 12th 1·54 in. of rain fell in an hour at Whitstable, and on the 19th during the passage of a small cyclonic system outside our extreme south-west coasts, 2·75 in. fell at Ottery St. Mary, 3·03 in. at Milverton, and 3·07 in. at Wellington in Somerset.

Thunderstorms occurred in the south and east of England on the 22nd, when 1·48 in. fell at Broadstairs, and 2·03 in. at Margate 1·76 in. in an hour. Towards the close of the month temperature fell considerably, the thermometer on the 25th failing to reach 60° at many stations in the Midland Counties; this cool spell continued until quite the close of the month.

The general rainfall of the month, expressed as a percentage of the average, was :—England and Wales, 120; Scotland 86; Ireland 97; British Isles 104.

INTERNATIONAL BALLOON ASCENTS.

By W. H. Dines, F.R.S.

September 11th, 1911.

Starting Point.	Country.	A (Hc.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles	F
Crinan	Scotland ..	6·9	—72	8·8	—70	95	N.E.
Manchester	England ..	6·9	—73	10·7	—64	75	N.E. by E.
Pyrton Hill, 7 a.m.	,, ..	7·5	—69	11·4	—56	44	N.E.
,, 7 p.m.	,, ..	7·5	—69	9·0	—65	91	N.E. by E.
Brussels	Belgium ..	8·4	—79	10·3	—74	13	E.N.E.
Paris.....	France	7·6	—75	10·2	—71	10	N.E. by E.
Vienna.....	Austria ..	7·3	—84	7·5	—77	61	S.
Pavia	Italy	8·2	—86	10·2	—77	22	S. by W.
Pavlovsk.....	Russia	5·6	—55	8·7	—44	44	S.
September 12th, 1911.							
Crinan	Scotland ..	7·1	—66	9·5	—63	187	N.E.
Manchester.....	England ..	7·5	—62	14·5	—49	88	N.E.
PyrtonHill	,, ..	7·5	—68	11·3	—54	50	N.E.
,, 7 p.m.	,, ..	7·2	—67	11·8	—68	71	N.E. by N.
Petersfield	,, ..	7·5	—74	11·9	—58	62	N.E. by N.
,, 7 p.m.	,, ..	6·9	—70	11·2	—72	68	N.E. by N.
Brussels	Belgium ..	8·4	—85	13·1	—63	16	E.
Hamburg.....	Germany..	7·9	—85	8·3	—83	26	E.S.E.
Paris.....	France ...	7·8	—86	9·7	—68	16	N.E.
Strassburg	Germany ..	?		7·9	—81	9	E.N.E.
Vienna.....	Austria	7·6	—75	10·5	—65	27	S. by E.
Pavia	Italy	7·4	—61	8·8	—56	18	E. by N.
Pavlovsk.....	Russia	6·4	—59	8·2	—49	111	S. by E.
Nishni Olchedaeff	,, ..	6·7	—61	10·8	—54	61	S.S.E.

September 13th, 1911.

Starting Point.	Country.	A (H_c) miles	B (T_c) ° F.	C miles.	D ° F.	E miles.	F
Crinan	Scotland ..	6·3	—54	9·4	—49	109	E.N.E.
„ 6.40 p.m,..	„	5·9	—56	10·6	—56	44	E.
Manchester.....	England ..	6·3	—50	14·3	—45	53	N.E. by E.
Pyrton Hill, 6.50 p.m.	„	6·9	—60	8·8	—60	73	E.N.E.
Brussels	Belgium ..	8·4	—74	?	?	58	N.E.
Hamburg	Germany..	7·6	—76	8·4	—75	45	N.E. by E.
Lindenberg.....	„	7·9	—79	9·3	—65	29	E.
Paris.....	France			7·2	—76	78	E.N.E.
Strassburg.....	Germany ..	7·9	—79	11·1	—72	60	E.N.E.
Munich	„ ..	7·8	—79	10·3	—62	25	E.
Pavia	Italy	8·0	—85	13·3	—65	13	S.E.
Pavlovsk.....	Russia	6·9	—66	11·9	—54	121	S.S.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On September 11th a deep low pressure area lay to the East of Iceland, and another over Eastern Russia, while an anticyclone stretched from South Sweden to Austria. On the 12th the Icelandic low pressure had disappeared and small but shallow depressions lay over the Bay of Biscay, and also over the North Sea, a high pressure still covered Austria. On the 13th a low pressure was found over Norway and Sweden, and a small high pressure to the West of Ireland. The Austrian high pressure had moved eastwards towards the Black Sea.

The week was remarkable for the break up of the excessively hot dry period which had prevailed throughout the summer of 1911. In England the change occurred on Tuesday evening, the 12th, with a drop of 20° F. and the temperature of the following week was nearly 20° F. less than that of the preceding. The accompanying rise of temperature in the upper strata is very plainly shown in the values of T_c over England on Wednesday the 13th, but the change had not reached the continent.

Over England H_c had also decreased by about a mile. It is the general rule that if the temperature of the lower air column falls, that of the upper air column, *i.e.*, the air above 7 miles, will rise, and the value of H_c will decrease.

THE EDINBURGH METEOROLOGICAL CONFERENCE.

We have received intimation that, owing to the International situation, the Meteorological Conference which was to have been held in Edinburgh from September 7th to 12th, will not take place, having been indefinitely postponed.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

VISIBILITY.

I WAS surprised that Mr. W. H. Dines considers the haziness of the air depends on the character of the district from which it comes. At the same place, with, for instance, easterly winds, I have on different occasions noticed extreme haziness and extreme clearness.

The other day a sudden N. wind brought hazy dullness which I have noticed before under similar conditions, but in winter imagined it might be an accumulation of London fog and smoke drifting south. But such an explanation would not meet this recent case. There was a very marked fall of temperature. Might this be the reason?

G. WESTON.

Bethersden, Kent, July 12th.

P.S.—Since writing, there has been a fall of 1·42 in of rain within an hour; which seems worthy of note.—G. W.

WITH reference to the letters from various correspondents on the question of visibility as a sign of rain, I would like to mention that this subject was dealt with by the late Hon. Ralph Abercromby and myself in our joint paper on "Popular Weather Prognostics," which was read before the Royal Meteorological Society in 1882. (Quarterly Journal Met. Soc., vol. 9, p. 27).

We there showed that in the wedge-shaped area of high barometric pressure which is frequently formed between a retreating and an advancing depression, that there is often great visibility with a cloudless sky, which occurs during the very fine weather on the east side of the wedge-shaped area. We quoted a number of weather sayings or prognostics for rain which we considered were to be explained by this condition of barometric pressure. The reason of "visibility" is uncertain; the old idea that it was due to excess of vapour is no doubt erroneous. The dry and wet bulb hygrometer always indicates a considerable amount of dryness when it is remarked.

There is another distribution of barometric pressure with which visibility as a prognostic of rain occurs, and that we called "straight isobars." Although there is little rain actually with these, the area which they cover to-day will probably be covered by a depression to-morrow—the conditions being favourable for the passage of depressions. With this type there is often great visibility with a hard overcast sky and moderately dry air, in which the stratus seems to play the part of a sunshade, for as soon as the sun comes out the

clearness of distant objects diminishes. This visibility should not be confounded with the visibility with a cloudless sky, which occurs with wedge-shaped isobars.

WM. MARRIOTT.

WIND DIRECTION AND RAINFALL.

I HAVE read with interest the notice in the July number of the *Meteorological Magazine* of the paper read by Mr. Bartlett at the meeting of the Royal Meteorological Society on "The Relation between wind direction and Rainfall." It may interest him to know that I have taken the wind direction and rainfall here for the decade 1900-1909, and the result is shown in the table below :—

Decade 1900-1909.

	North.	N.E.	East.	S.E.	South.	S.W.	West.	N.W.	Calm.	Total.
Wind days...	29	34	21	37	18	91	33	72	30	365
Fine days	17	20	12	13	3	25	13	36	14	153
Rain days ...	12	14	9	24	15	66	20	36	16	212
Rain..... ins.	1·30	1·57	1·51	4·95	3·18	9·55	2·51	3·28	2·21	30·06

MORRIS BIRKBECK.

Kalsi, Shortheath, Farnham, Surrey, July 19th, 1914.

A WARNING AGAINST UNCERTIFIED MEASURING GLASSES.

THE figures obtained for the first part of last year having shown discrepancies with those of surrounding gauges, I was led to calibrate the measuring glass belonging to the temporary gauge which I had used for this period, by comparison with a certified measure. The glass had been supplied by a well-known stores. The comparison brought to light the following glaring errors.

Old measuring glass.	Standard measuring glass.
in.	in.
·50	·55
·41	·45
·35	·39
·26	·29
·20	·21
·16	·16
·10	·10
·04	·03
·02	·01
·01	The space occupied by this division is mostly solid glass

These figures, which were selected somewhat at random from those obtained in the comparison, should serve as a warning against using measuring glasses without certificates.

A. E. SWINTON.

Swinton House, Duns, Berwickshire.

HEAVY STORM IN THE ISLE OF THANET.

A VERY remarkable storm for the Isle of Thanet occurred on July 22nd. At about 2 p.m., observing at Garlinge, Westgate-on-Sea, I noticed a deep gloom toward the east, over Margate and Ramsgate. This gradually spread over towards my place of observation, until at 2.30 it became necessary to use artificial light. At this period there was one slight " crackle " of thunder, but no lightning was seen, and no rain fell. At 2.45, however, the storm seemed to " burst " suddenly overhead, and there were two simultaneous flashes and crashes of lightning and thunder. The rain then descended in torrents for half-an-hour, and ·72 in. was deposited in my gauge. Owing to the courtesy of the various Observers I am able to give the falls at other points in the Isle of Thanet. At Margate (Clifton-ville) the fall was as much as 2·03 in. The Observer here also reports that 1·50 in. fell in an hour, several parts of the town being flooded. It was an extraordinary downpour for the district, and Mr. C. J. Pemble, Assistant to the Borough Meteorologist, to whom I am indebted for these figures, tells me that the only approach to such a fall in fifteen years records was 1·21 in. on July 23rd, 1903.

Returning to the storm of July 22nd last, the rainfall at Broad-stairs (St. Peter's) was 1·82 in., and at Ramsgate, 1·15 in.

It is a curious thing that storms pass to the right and left of a line drawn through Garlinge, which has the lowest rainfall of the Isle of Thanet. The storms pass over Herne Bay and Birchington on one side and Margate and Ramsgate on the other, leaving Westgate and Garlinge fairly free from such visitations.

D. W. HORNER, F.R.Met.Soc.

Garlinge, Westgate-on-Sea, July 31st, 1914.

THE STORM OF JULY 1st, 1914.

THE storm commenced about 5.30 with a wind squall which raised great clouds of dust. Then rain descended in a deluge. During the first half hour the rain was very heavy and the thunder and lightning very violent and almost incessant. One terrific crash occurred at 5.45, and sounded like a battery of guns going off one after the other. The lightning struck the chimney of the Council School close to Winksworth Station, where I was waiting for the storm to abate. After 6 o'clock the violence of the storm abated, but rain continued to fall heavily, with occasional thunder and lightning until 9 o'clock. Another sharp shower with one or two flashes of lightning occurred soon after 10 p.m.

The total fall up to 9 a.m. on the 2nd was 1·09 in. Of this about ·60 in. fell in the 75 minutes ending 6.45 p.m. Another heavy storm occurred about 7 p.m. on 2nd July. THOMAS GIBBS.

Greengates, Worksworth.

RAINFALL TABLE FOR JULY, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·57	1·26
Tenterden	*Kent*	51 4	*0 41	190	2·21	2·03
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·46	1·66
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·42	3·52
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·43	3·11
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·54	...
Shoeburyness	*Essex*	51 31	*0 48	13	1·73	2·54
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·68	2·50
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·37	2·29
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·74	4·49
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·68	6·12
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·75	3·64
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·58	4·39
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·60	1·72
Boston	*Lincolnshire*	52 58	0 1	11	2·35	1·22
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·35	2·28
Macclesfield	*Cheshire*	53 15	2 7	501	3·41	4·55
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	2·92	4·73
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·75	3·73
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·56	3·98
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·39	3·36
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·90	2·92
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	8·91	6·23
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·26	6·50
Haverfordwest	*Pembroke*	51 48	4 58	90	3·39	5·44
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·03	5·60
Llandudno	*Carnarvon*	53 20	3 50	72	2·52	3·49
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·20	2·81
Marchmont House	*Berwick*	55 44	2 24	498	3·30	1·47
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·73	2·90
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·91	2·46
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	4·72	2·27
Mull (Quinish)	,,	56 34	6 13	35	4·12	3·12
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·84	2·15
Braemar	*Aberdeen*	57 0	3 24	1114	2·65	2·12
Aberdeen (Cranford)	,,	57 8	2 7	120	3·00	4·01
Cawdor	*Nairn*	57 31	3 57	250	3·14	3·27
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·98	1·42
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	5·35	5·76
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·91	3·53
Wick	*Caithness*	58 26	3 6	77	2·67	3·62
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·53	4·10
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·13	3·70
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·02	2·18
Ennistymon House	*Clare*	52 57	9 18	37	3·57	3·56
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·90	3·01
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·99	3·33
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·60	2·23
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·16	2·65
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·26	4·32
Cong (The Glebe)	,,	53 33	9 16	112	3·72	4·27
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·36	4·18
Seaforde	*Down*	54 19	5 50	180	3·32	2·47
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·28	1·43
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·34	2·53

RAINFALL TABLE FOR JULY, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
—1·31	49	·34	5	15	13·53	12·39	—1·14	92	25·11	Camden Square
— ·18	92	·45	15	15	13·65	15·11	+1·46	111	27·64	Tenterden
— ·80	67	·50	12	13	14·92	15·79	+ ·91	106	30·48	Patching
+1·10	146	1·26	19	20	15·73	17·52	+1·79	111	31·87	Cadland
+ ·68	128	·64	2	18	13·03	13·66	+ ·63	105	24·58	Oxford
...	...	...	...	...	13·68	...	..	...	25·17	Croyland Abbey
+ ·81	147	1·77	15	12	9·73	10·52	+ ·79	108	19·28	Shoeburyness
— ·18	93	·96	3	10	13·44	13·82	+ ·38	103	25·40	Westley
— ·08	97	·94	15	14	11·98	12·12	+ ·14	101	23·73	Geldeston
+1·75	164	·93	19	20	18·62½	25·04	+6·42	135	38·27	Polapit Tamar
+3·44	228	3·20	19	16	17·01	21·49	+4·48	126	33·54	Rousdon
+ ·89	132	·52	2	23	15·83	16·81	+ ·98	106	29·81	Stroud
+1·81	170	1·74	2	17	16·88	16·61	— ·27	98	32·41	Wolstaston
— ·88	66	·50	6	11	15·35	11·52	—3·83	75	28·98	Coventry
—1·13	52	·20	1	18	12·21	10·59	—1·62	87	23·35	Boston
— ·07	97	·75	1	15	13·15	10·36	—2·79	79	24·46	Hodsock Priory
+1·14	133	1·20	16	23	18·17	19·88	+1·71	109	34·73	Macclesfield
+1·81	162	1·19	16	19	15·88	15·73	— ·15	99	32·70	Southport
—1·02	79	1·15	16	17	31·97	31·91	— ·06	100	61·49	Arncliffe
+1·42	156	2·10	1	9	14·19	13·17	—1·02	93	26·87	Ribston Hall
+ ·97	141	1·35	2	18	13·47	11·70	—1·77	87	26·42	Hull
+ ·02	101	1·23	16	14	14·45	14·33	— ·12	99	27·94	Newcastle
—2·68	70	1·38	31	19	65·29	70·11	+4·82	107	129·48	Seathwaite
+3·24	199	1·70	19	26	20·48	27·18	+6·70	133	42·28	Cardiff
+2·05	160	1·11	4	17	22·84	23·36	+ ·52	102	46·81	Haverfordwest
+1·57	139	1·16	1	21	22·15	26·36	+4·19	119	45·46	Gogerddan
+ ·97	139	1·12	1	16	14·89	15·73	+ ·84	106	30·36	Llandudno
— ·39	88	·73	30	16	22·26	24·62	+2·36	111	43·47	Cargen
—1·83	45	·54	31	8	17·68	14·08	—3·60	80	33·76	Marchmont
— ·83	78	·77	14	17	24·83	27·77	+2·94	112	49·77	Girvan
— ·45	85	1·15	1	10	18·42	18·30	— ·12	99	35·97	Glasgow
—2·45	48	·49	5	16	34·04	37·81	+3·77	111	68·67	Inveraray
—1·00	76	·54	6, 11	19	27·67	28·65	+ ·98	104	56·57	Quinish
— ·69	76	·71	31	13	14·86	13·00	—1·86	87	28·64	Dundee
— ·53	80	·65	2	14	17·80	18·99	+1·19	107	34·93	Braemar
+1·01	134	·73	15	13	17·02	15·57	—1·45	91	32·73	Aberdeen
+ ·13	104	·51	26	14	15·65	14·90	— ·75	95	29·33	Cawdor
—1·56	48	·36	6	14	23·20	20·85	—2·35	90	44·53	Fort Augustus
+ ·41	108	1·28	22	16	42·90	51·98	+9·08	121	83·93	Bendamph
+ ·62	121	1·21	6	16	17·19	17·28	+ ·09	101	31·90	Dunrobin Castle
+ ·95	136	·86	25	18	15·38	15·50	+ ·12	101	29·88	Wick
+ ·57	116	·70	4	27	28·40	34·78	+6·38	122	54·81	Killarney
+ ·57	118	·69	4	18	20·53	19·05	—1·48	93	39·57	Waterford
— ·84	72	·52	18	18	20·53	20·60	+ ·07	100	39·43	Castle Lough
— ·01	100	·95	30	26	23·24	27·22	+3·98	117	46·52	Ennistymon
+ ·11	104	·74	4	13	18·32	17·27	—1·05	94	34·99	Courtown Ho.
+ ·34	111	·47	18	19	18·83	18·91	+ ·08	100	35·92	Abbey Leix
— ·37	86	·69	4	20	14·75	11·24	—3·51	76	27·68	Dublin
— ·51	84	·40	4	17	19·17	18·42	— ·75	96	36·15	Mullingar
+1·06	132	·89	1	22	26·64	29·77	+3·13	112	52·87	Enniscoe
+ ·55	115	1·06	30	20	25·13	28·50	+3·37	113	48·90	Cong
+ ·82	124	·58	26	21	22·19	24·67	+2·48	111	42·71	Markree
— ·85	74	·75	3	15	20·74	17·61	—3·13	85	38·91	Seaforde
—1·85	44	·29	31	16	18·77	17·42	—1·35	93	37·56	Dundarave
— ·81	76	·35	4	16	20·44	21·22	+ ·78	104	39·38	Omagh

SUPPLEMENTARY RAINFALL, JULY, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	2·22	XI.	Lligwy	...
,,	Ramsgate	3·56	,,	Douglas	2·84
,,	Hailsham	1·87	XII.	Stoneykirk, Ardwell House...	4·22
,,	Totland Bay, Aston House...	3·44	,,	Dalry, The Old Garroch.....	3·35
,,	Stockbridge, Ashley..	2·66	,,	Beattock, Kinnelhead	3·48
,,	Grayshott	2·63	,,	Langholm, Drove Road	3·60
III.	Harrow Weald, Hill House...	1·65	XIII.	Meggat Water, Cramilt Lodge	1·90
,,	Caversham, Rectory Road ...	2·14	,,	North Berwick Reservoir.....	...
,,	Pitsford, Sedgebrook.....	2·66	,,	Edinburgh, Royal Observaty.	2·35
,,	Woburn, Milton Bryant.....	1·80	XIV.	Maybole, Knockdon Farm ...	1·91
,,	Chatteris, The Priory..... ...	1·27	XV.	Ballachulish House	...
IV.	Elsenham, Gaunts End	1·96	,,	Campbeltown, Witchburn ..	2·34
,,	Colchester, Hill Ho., Lexden	2·03	,,	Holy Loch, Ardnadam.....	3·20
,,	Ipswich, Rookwood, Copdock	1·33	,,	Islay, Eallabus	2·99
,,	Blakeney..... . ..	1·36	,,	Tiree, Cornaigmore	2·81
,,	Swaffham	1·10	XVI.	Dollar Academy	3·70
V.	Bishops Cannings	3·94	,,	Balquhidder, Stronvar.....	3·24
,,	Wimborne, St. John's Hill ...	4·05	,,	Glenlyon, Meggernie Castle..	2·43
,,	Ashburton, Druid House.. ...	4·79	,,	Blair Atholl	2·93
,,	Cullompton	4·09	,,	Coupar Angus	3·02
,,	Lynmouth, Rock House	3·91	,,	Montrose, Sunnyside Asylum.	2·50
,,	Okehampton, Oaklands.. ...	4·67	XVII.	Alford, Lynturk Manse	3·30
,,	Hartland Abbey.....	4·22	,,	Fyvie Castle	5·48
,,	Probus, Lamellyn.....	4·94	,,	Keith Station	4·89
,,	North Cadbury Rectory.....	4·80	XVIII.	Rothiemurchus	3·18
VI.	Clifton, Pembroke Road.....	5·60	,,	Loch Quoich, Loan	9·15
,,	Ross, The Graig	4·73	,,	Drumnadrochit	2·21
,,	Shifnal, Hatton Grange.....	4·70	,,	Skye, Dunvegan	3·18
,,	Droitwich.....	3·41	,,	Lochmaddy, Bayhead	2·83
,,	Blockley, Upton Wold.....	4·08	,,	Glencarron Lodge	5·62
VII.	Market Overton.....	2·35	XIX.	Invershin	3·87
,,	Market Rasen	2·35	,,	Melvich	5·22
,,	Bawtry, Hesley Hall	2·66	,,	Loch Stack, Ardchullin	7·44
,,	Derby, Midland Railway.....	3·53	XX.	Skibbereen Rectory	4·88
,,	Buxton	5·07	,,	Dunmanway, The Rectory ..	4·43
VIII.	Nantwich, Dorfold Hall	4·45	,,	Glanmire, Lota Lodge, No. 1	4·48
,,	Chatburn, Middlewood	4·22	,,	Mitchelstown Castle.....	5·41
,,	Cartmel, Flookburgh	5·52	,,	Darrynane Abbey.....	6·11
IX.	Langsett Moor, Up. Midhope	2·77	,,	Clonmel, Bruce Villa	2·35
,,	Scarborough, Scalby	5·08	,,	Newmarket-on-Fergus, Fenloe	3·46
,,	Ingleby Greenhow	5·90	XXI.	Laragh, Glendalough	2·99
,,	Mickleton	1·40	,,	Ballycumber, Moorock Lodge	2·80
X.	Bellingham, High Green Manor	2·61	,,	Balbriggan, Ardgillan	2·56
,,	Ilderton, Lilburn Cottage ...	1·69	XXII.	Woodlawn	2·70
,,	Keswick, The Bank.....	3·69	,,	Westport, St. Helens	3·79
XI.	Llanfrechfa Grange	5·58	,,	Dugort, Slievemore Hotel ...	3·50
,,	Treherbert, Tyn-y-waun	8·10	,,	Mohill Rectory	3·19
,,	Carmarthen, The Friary	6·46	XXIII.	Enniskillen, Portora.....	2·95
,,	Castle Malgwyn [Llechryd]...	3·15	,,	Dartrey [Cootehill]	2·60
,,	Crickhowell, Tal-y-maes.....	5·40	,,	Warrenpoint, Manor House ..	3·17
,,	New Radnor, Ednol	5·40	,,	Banbridge, Milltown	2·01
,,	Birmingham WW., Tyrmynydd	6·08	,,	Belfast, Cave Hill Road	2·56
,,	Lake Vyrnwy	...	,,	Glenarm Castle..... ...	...
,,	Llangyhanfal, Plâs Draw.....	5·42	,,	Londonderry, Creggan Res ..	3·31
,,	Dolgelly, Bryntirion.....	6·16	,,	Dunfanaghy, Horn Head ...	3·57
,,	Bettws-y-Coed, Tyn-y-bryn...	3·45	,,	Killybegs	5·19

METEOROLOGICAL NOTES ON JULY, 1914.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—A fine or fair month, with occasional light R. Temp. fluctuated considerably, being generally higher in the first half than in the latter half. There were no sunless days, but the daily amounts of sunshine were not large, only four days having more than 10 hours duration. Mean temp. 64°·4, or 0°·9 above the average. Duration of sunshine 150·2* hours, and of R, 28·7 hours. Evaporation 2·72 in. Shade max. 93°·7 on 1st, and the highest temp. since the record high temp. of 97°·1 on August 9th, 1911; min. 47°·3 on 30th. F 0, f 0.

TENTERDEN.—Hot on 1st and from 10th to 14th. TS on 12th, and numerous things struck in the neighbourhood. Duration of sunshine 198† hours. Shade max. 86°·5 on 1st; min. 47°·0 on 31st. F 0, f 0.

TOTLAND BAY.—The wettest July since 1894. Duration of sunshine 212·0* hours, or 25·8 hours below the average. Shade max. 79°·5 on 1st; min. 48°·8 on 30th. F 0, f 0.

PITSFORD.—Mean temp. 61°·4. R ·95 in. below the average. Shade max. 85°·6 on 1st; min. 46°·3 on 29th.

IPSWICH, COPDOCK.—R much needed. Mean temp. 62°·5. Duration of sunshine 186·8* hours. Shade max. 83°·5 on 1st; min. 45°·4 on 31st. F 0, f 0.

ROUSDON.—The wettest July since observations began in 1883. Continuous R from 8 p.m. on 18th to 2 a.m. on 20th, the total being 3·70 in., of which 3·20 in. fell on 19th, the heaviest daily fall in 31 years.

NORTH CADBURY.—Much the wettest July in at least 20 years. Shade max. 90° on 1st; min. 43° on 4th. F 0, f 0.

HODSOCK PRIORY.—Shade max. 84°·2 on 21st; min. 44°·7 on 31st. F 0, f 0.

SOUTHPORT.—The wettest July, except 1909, for 25 years. Damaging TSS on 1st and 2nd. Duration of sunshine 172·5* hours, or 39·8 hours below average. Duration of R 69·8 hours. Mean temp. 60°·4, or 1°·0 above average. Shade max. 80° on 10th; min. 47° on 4th. F 0, f 0.

HULL.—TSS on 1st and 2nd, with R measuring 2·12 in., then finer to 12th; afterwards cloudy generally, with R on most days. Duration of sunshine 98·3* hours. Shade max. 78° on 21st; min. 48° on 23rd. F 0, f 0.

HAVERFORDWEST.—Fine and warm, with considerable R but no TSS. Duration of sunshine 202·9* hours. Shade max. 76°·2 on 1st; min. 47°·8 on 6th.

LLANDUDNO.—Shade max. 79° on 11th; min. 50° on 29th.

CARGEN.—Comparatively high temp., culminating in the shade max. of 83°·5 on 21st, prevailed for the first 3 weeks, followed by a sudden fall, 20° being difference between max. on 21st and 23rd. Shade min. 37°·0 on 4th.

ARDNADAM.—Pleasant, dry month, except 23rd to 27th which were almost wintry. Shade max, 75°·6 on 21st; min. 38°·1 on 4th. F 0, f 0.

ABERDEEN.—Wet, with little sunshine and frequent fog. N.N.W. gale on 24th to 26th.

LOCH STACK.—Duration of sunshine 151·8* hours.

ENNISTYMON.—A month of many showers which, owing to high winds, did not benefit the parched land much, but impeded hay-making.

DUBLIN.—A changeable but withal favourable month. There was again a marked prevalence of N.W. winds and clouds. Mean temp. 59°·6. Shade max. 73°·8 on 21st; min. 48°·3 on 3rd. F 0, f 0.

MARKREE.—Stormy and wet, with low temp. for the time of year, though the nights were mild.

KILLIBEGS.—A fine month on the whole. Fairly sunny with some hot days.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, February, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	59·1	14	29·4	27	51·1	38·5	40·7	88	91·9	27·3	2·37	14	6·8
Malta	65·7	21	47·0	24	59·5	51·2	...	85	121·0	..	1·71	6	1·1
Lagos	90·4	22	72·0	14	89·1	77·0	74·6	75	151·0	69·0	1·17	5	5·0
Cape Town	94·3	7	48·1	13	79·6	60·9	57·7	65	...	...	·33	4	2·2
Natal, Durban ...	81·0	8, 14	66·0	15	76·3	69·5	68·8	80	...	...	9·11	18	7·0
Johannesburg	87·4	3	48·2	27	77·7	56·3	54·8	76	157·0	46·0	3·09	13	6 0
Mauritius	89·0	6	67·1	3	86·4	73·9	73·5	82	...	69·8	8·57	19	5·7
Bloemfontein	95·4	2	55·4	27	85·8	60·9	56·7	60	...	...	1·58	10	1·6
Calcutta...	91·8	14	53·6	7	84·6	64·7	62·6	68	...	47·5	1·04	2	2·7
Bombay...	86·2	20	62·1	19	83·0	69·5	64·5	68	135·0	53·7	·08	1	1·4
Madras	89·3	6	63·2	25	86·5	68·6	67·4	74	154·2	59·1	·00	0	1·6
Colombo, Ceylon ...	93·1	10	66·6	6	88·2	71·4	70·4	75	159·8	59·0	1·56	3	3·4
Hongkong	78·3	19	48·7	11	66·9	59·9	57·0	79	...	...	3·24	8	7·7
Sydney	94·9	9	60·3	13	78·0	66·5	60·0	67	147·7	51·7	1·69	16	6·1
Melbourne	106·0	17	49·0	13	82·6	59·3	53·0	52	160·8	42·7	·15	4	3·0
Adelaide	111·9	18	48·8	11	90·4	63·4	53·1	41	165·3	39·5	·34	2	2·7
Perth	103·0	24	48·9	18	81·8	61·8	55·8	57	167·0	46·1	·83	5	3·3
Coolgardie	106·4	16	51·0	19	91·0	61·7	51·1	38	171·8	46·8	·45	3	2·8
Hobart, Tasmania ..	93·2	14	48·0	8, 14	72·0	53·7	49·5	61	142·8	41·3	·11	5	5·8
Wellington	79·0	17	45·4	27	69·7	56·9	55·0	75	140·4	37·0	1·93	11	6·4
Auckland	77·0	20	50·0	27	72·3	60·3	58·6	76	150·0	44·0	1·66	9	5·7
Jamaica, Kingston ..	91·4	9	61·7	23	87·2	68·5	63·9	66	...	...	·28	2	...
Grenada	87·0	26, 27	69·0	10	82·9	72·1	...	73	137·0	...	2·09	12	3·0
Toronto	44·7	3	-18·2	12	23·3	7·7	9·1	82	79·6	-20·2	1·87	12	4·1
Fredericton	47·5	28	-24·0	22	21·1	-3·9	...	78	...	...	1·40	8	3·8
St. John, N.B. ...	43·9	7	-19·7	12	23·9	6·1	5·0	69	...	...	2·10	8	3·9
Edmonton, Alberta ...	50·2	15	-34·6	5	17·9	-3·7	...	77	106·3	-40·2	·63	13	6·4
Victoria, B.C.	53·3	20	25·6	5	46·1	37·9	37·0	82	...	...	1·56	13	7·3

Johannesburg.—Bright sunshine 204·4 hours.

Mauritius.—Mean temp. of air 1°·2, dew point 2°·4, and R 1·54 in., above averages. Mean hourly velocity of wind 6·9 miles, or 4·1 below average.

COLOMBO.—Mean temp. of air 79°·9, or 0°·2 below, and R ·07 in. above, averages. Mean velocity of wind 3·7 miles per hour. TS on 14th and 15th.

HONGKONG.—Mean temp. of air 63°·1. Mean hourly velocity of wind 14·4 miles. Bright sunshine 117·6 hours.

Melbourne.—Mean temp. of air 3°·7 above, and R 1·58 in. below, averages.

Adelaide.—Mean temp. of air 2°·9 above, and R ·28 in. below, averages.

Perth.—Mean temp. of air 2°·4 below average.

Coolgardie.—Temp. of air 0°·3 above, and R ·24 in. below, averages.

Hobart.—Temp. of air 0°·6 below average.

Wellington.—Mean temp. of air 1°·0 above, and R 1·50 in. below, averages. Bright sunshine 213·7 hours.

Auckland.—R barely half the average. Mean temp. slightly below average.

ALBERTA, EDMONTON.—A cold, showery month, with great temp. variations, and heavy W. gale on 27th.

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ASPECTS OF THE WAR.

Next to those in this country who have family ties in Germany or Austria, the bitterness of the war must be felt most keenly by the scientific workers whose fast friends and true comrades in research have suddenly become, at the call of their country, enemies and aliens. Our readers in particular have profited in the past from the generous co-operation in our work of the leaders of meteorological science in Austria and Germany. We have had so much to do with international collaboration in the study of the atmosphere and the ocean, which have no territorial limits, that the outbreak of war, unsoldering all the goodliest fellowship of common work, is in itself a defeat of our most cherished aims. It puts back the clock for generations it may be, and dashes our hope of reaching in our lifetime the promised land of full brotherly sympathy and co-operation, of which the Pisgah vision had recently been so clear.

The tremendous force of nationality and the unifying power of a common danger, which the war has demonstrated, are glimpses of real good arising already from the evil. The spectacle of the United Kingdom really united for the first time within the memory of most of us, of the British Empire spontaneously at one, showing no dividing line of subject and dominant race, or conquered and conquering people, offers some promise that out of the incalculably greater disruption which has torn apart the peoples of Europe, there may yet arise far off a still greater incarnation of unity.

We fully recognize that this is no time for brooding mournfully over the broken strings of international scientific progress, or for dreaming dreams of a new heaven and a new earth. At the moment the duty of everyone is clearly to support their country in a life and death struggle. We confidently believe that our side is right and must prevail. The sanctity of treaty obligations must be vindicated, the power of waging aggressive war must be restrained, and the nation that can obliterate an ancient university as an act of terrorism must be taught, just as Anarchist terrorists must be taught, that such methods of warfare are an outrage on civilization and an intolerable disgrace to humanity.

May not the originator of such a policy fear that his name in history may be changed, like that of Pashur, the son of Immer, to Magormissabib—a terror to himself and to all his friends.

ARGUMENTS FOR BASAL AND IMMEDIATE CROP ESTIMATES.

By H. Helm Clayton and W. M. Hays.

Estimates of crop conditions based on reports made by growers and by bureau agents are expensive, can be made only periodically and are mainly delayed records of climatic effects already wrought out in changed condition of crops.

Periodical estimates based on observed conditions as to the acreage and the excellent growth of the crop are, however, necessary at wide intervals of time to serve as bases of both annual and of immediate statistical estimates; and not being frequent, the expense of securing carefully made reports can thus be afforded.

If thus supplemented by "immediate estimates" based on climatic changes, the periodic reports of the conditions may be less frequent and at much less expense may be prepared with greater care.

The weather is the one great varying factor in crop production. By using the local records of temperature and rainfall of the destructive storms, and estimates of prospective climatic changes, prospects of crops can be foretold some time before the crops themselves indicate results of climatic changes, and in some cases before the climatic changes have occurred.

Since reports of meteorological conditions are gathered daily by telegraph they serve as an immediate basis for predicting changes in crop yields. And since a World Meteorological Organization will enable meteorological officers to predict meteorological changes, even these weather predictions will serve as bases for immediate estimates of crop prospects.

Immediate reports, based on climatic records, can supply to the public the needed estimates, quickly giving modifications of the estimates announced in the last previous periodical reports of the crop prospects.

Thus if the periodical report estimates the prospects of the crop of corn, as of August 1st, 1913, is 3,000,000,000 bushels, and a widespread drought gradually reduces the prospective yield, the record of high temperature and lack of rainfall will serve as a weekly or more frequent basis for immediately reducing the figure representing the prospective total yield. And if the weather forecasters can, with reasonable accuracy, forecast the continuance or the termination of the drought, that fact also can be utilized in determining what the immediate estimate should be.

This use of weather reports will provide for a school of methods in which the national statistical weather bureaus will learn to so co-operate and so organize the gathering of data, the predicting and the reporting of the co-ordinated data, that they will better use

the agencies at the command of the weather services in making the numerical figure at the periods regular of making " basal estimates."

The extension of the international and national reports on crops, so as to give immediate prediction as to what the effect of the weather is likely to be on each given crop, will greatly restrict the place now held by the private crop reporter, who helps his firm to get that advantageous position of a knowledge of what is coming and to take the advantage, either in speculation or in holding the wide difference in the price between the producer and consumer, while he reaps a too large middleman's profit for any service he may render.

Under this plan the statistics of crops, now confined largely to the non-perishable products, may be extended also to the perishable products, thus to do far more efficiently and economically that which is now done but poorly mainly by private parties, and with relatively high cost. There is, for example, no need of a loss of seventy-five carloads of strawberries for lack of railway cars when a large crop was ripening rapidly in one region of Virginia, because two rail roads lost out in not knowing until a few days too late that that they must have cars ready for a bumper crop at several stations on each of the two lines. Many of the facts secured at large expense by the California Fruit Exchange could, with little added expense, be secured for all similar exchanges, and would, at the same time, be available to railway and steamship transporting companies and to dealers, consumers and producers. Under this plan the agents of co-operative organizations will be able to sell and purchase their products under the same wide knowledge of conditions as the large city corporation now has through its specialized statistical service, and as the operators on the speculative markets also have at the cost of privately managed statistical bureaus.

This plan will lead statistical bureaus to be more inclusive and more comprehensive, so as to cover more nearly all the new factors needed in deciding the daily prices current in the market centres. The boards of trade and other assembled markets, and also the non-assembled markets, will, under the plan of broader, more detailed and more immediate statistics, limit their function to that of judging as to what the price should be, leaving to the public statistical bureaus the function of gathering and making known the basic data which mainly determine the fluctuations in supply and demand.

This will greatly relieve the market dealers from the influences of speculation, placing them in a better judicial position in determining the daily price warranted by the conditions nature has placed on production and demand.

Under a complete system of general and immediate statistics the more stable conditions of prices will give a narrower field for the influence of ownership in margins and futures, and there will be less opportunity for dealing in options in whatever form. There will also be less need of hedging on the part of manufacturers and dealers.

Furthermore, if the government will assume its full share of the work of commerce, that of giving full and immediate reports on acreage, conditions, amount harvested, amounts in store, whether in the raw or manufactured form; and as to the prospective purchasing power of those needing each product, it can the more consistently place restrictive measures about such excesses in our markets as speculation in assembled markets, wrong commission charges on the part of dealers who receive consignments of products for sale, and the surreptitiously storing in elevators and cold storage houses that can be used to widen unduly the range of prices between producers and consumers.

By extending the statistical service to perishable products, a national statistical service can so serve co-operative organizations and each local community can organize and sell or purchase its perishable products without undue profits being absorbed by middlemen.

This service will thus greatly assist in building up co-operative organization. And since only by co-operation can the middle class compete with centralized capital, an immediate statistical service is an aid in building up a middle class. Thus the government will help to build up a class of family farm owners, instead of vast estates owned by private and corporate interests. It will also encourage the building up of a strong non-agricultural middle-class. The farmers' co-operative organization will naturally be concerned mainly with selling their products, while they raise most of the commodities they use. The industrial and other non-agricultural classes, on the other hand, will co-operate mainly in the purchase of their supplies, since the commodities they help to produce are mainly sold by the co-operation in which they serve.

It will help bring about the transfer under most economical methods of the distribution of the products of each class of producers to consumers. It will aid co-operative producers to sell more direct to co-operative consumers, and will thus lead to a part of the middleman class becoming producers of agricultural products and consumers of non-agricultural products or producers of non-agricultural products and consumers of agricultural products.

Sufficient organized co-operative selling and co-operative purchasing of products will help so to standardize the business of private middlemen that their service to producers and consumers will become economically more efficient, and will perform the social function of middlemen not only at less expense but vastly more efficiently than now.

The use of daily telegraphic weather reports will make possible so many extensions and refinements of crop statistics and estimates that the statistical service can be extended to nearly all perishable as well as non-perishable products.

With a much elaborated statistical service the statistical bureaus

will supply information which will decrease the fluctuations of the acreage planted of the respective crops, and will decrease the fluctuations in the number grown annually of the respective breeds of animals. With less fluctuation in the amount of production and less opportunity for speculation, prices will adhere more closely to an average profitable point, fair and profitable alike to the producers, consumers, transporters, manufacturers, and dealers.

All this will result in more stable conditions for the producer, the dealer, the manufacturer, the transporter and the consumer. It will lessen the highest achievements of dealers, but it will make even the business of the middleman more stable, and will give him a more honourable place in our economic life.

M. Teisserenc de Bort, late Director of the French Dynamical Meteorological Observatory, said in a communication to the International Congress of 1910 :—

"The marked progress made by meteorological science in recent years, brings more and more into prominence the necessity for considering meteorological phenomena over the Earth as a whole. We have learned that compensation prevails between the values of the various meteorological elements of different points. Such a compensation justifies us in connecting with general phenomena anomalies which appear at first sight to be accidental.

Again, if we wish to study the external influences affecting our atmosphere, we must include the entire Earth in our investigations. The meteorological data collected and published at the present day are almost sufficient for this purpose, if we are content to study phenomena which occurred two or three years ago ; but researches of this kind necessitate laborious examinations of many different volumes, and I do not think I shall be contradicted when I say that it would be very desirable to follow, step by step, the general course of the events as they occur, even if all we can do is to obtain a preliminary glance which will bring into relief points which require detailed subsequent study. Amid all the complications which the atmosphere presents we must try to distinguish the accidental and secondary from the essential, and to do this effectively we must avail ourselves of every opportunity which offers. In my opinion one of the most hopeful lines of progress lies in the direction of studying the daily changes of phenomena all over the world.

It seems to me unnecessary to insist further on the advantages of a scheme which would place before us, day by day, the principal data in the physics of the atmosphere as observed in equatorial, temperate and polar regions."

The Institute can thus bring about world co-operation, securing immediate world area crop estimates which will give the facts of crop conditions at once, and free to all interested persons and organizations, including co-operative organizations of producers

and consumers, and at the same time it can develop a world meteorological bureau which will be of the greatest service to mankind.

A start can be made at inaugurating these improvements with a comparatively small cost. Their utility will determine the amount of money ultimately required. Possibly some persons or institutions would assist in making a beginning, but it may be hoped that the Institute will have means of making the necessary small start which can grow.

We feel that these plans for multiplying and improving the meteorological and crop estimating services of the world, will be of great value in relation to industry and commerce, and in making more equitable the markets as agencies for the transfer of products from producers to consumers.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

BRIGHT AUGUST AT MARGATE.

The following figures of the rainfall, temperature, and hours of sunshine at Margate for August may be of interest.

Rainfall, ·25 in. This is the lowest record for August for over thirty years, the nearest to it being in August 1883 with ·37 in. Rain fell only on three days, and from the 6th to the 26th not any was registered. The sunshine was 228·5 hours. Mean temperature, 63°·8. The highest shade maximum was 77°·5 on the 30th. The lowest miminum 51° on the 7th.

C. J. PEMBLE.

11, Godwin Road, Margate, 3rd September, 1914.

[The remarkably low August rainfall reported by Mr. Pemble appears to have affected only a small area; the only other reading of less than half-and-inch was ·32 in. recorded at Shoeburyness, while in the immediate neighbourhood of Margate ·60 in. was measured at Westgate. The patchy nature of the rainfall of August is well known, but it is more usual to find small wet patches in a dry area than, as in this case, to find small dry patches in a comparatively wet area. Ed. *S.M.M.*]

THE AUTUMN FLOOD IN SNOWDONIA.

The following amounts of rain fell in Snowdonia, causing a big flood on Afon Glaslyn and Conway.

Date.	Pen-y-Gwryd.	Copper Mine.	Intake.	Bungalow.
	in.	in.	in.	in.
Aug. 8	6·35	4·63	5·42	5·00
,, 9	·07			

ARTHUR LOCKWOOD.

Hafod-y-Gwynt, Pen-y-Gwryd, Llanberis, August 17th, 1914.

TEMPERATURE DURING PARTIAL SOLAR ECLIPSE.

I DO not know whether the following eclipse readings taken here on August 21st are of sufficient interest for publication, but I give them for what they are worth.

August 21st, 1914.

Time. a.m.	Dry bulb.	Wet bulb.	Temp. on Grass.	Weather.
	°	°	°	
10.45	65·7	59·6	75·4	Sunny.
11.0	66·9	60·2	83·0	do.
11.15	66·4	59·0	79·0	do.
11.30	66·2	60·1	74·8	Thin cloud.
11.45	63·8	59 0	69·0	do.
Noon	63·4	59·4	67·6	do.
p.m.				
0.15	63·0	59·1	66·0	Thick cloud.
0.30	62·5	59·1	65·4	
0.45	62·5	59·0	65·4	
1.0	61·2	58·4	60·6	Raining.

The effect of the eclipse on temperature was less than that of the breakdown of the weather.

H. NOWELL FFARINGTON, F.R.Met.Soc.

Worden, Leyland, Lancashire, 28th August, 1914.

The following were the temperature readings taken at Camden Square by Mr. D. S. Salter :—

August 21st, 1914.

Time.	Dry Bulb.	Wet Bulb.	SUN MAX. Black Bulb
a.m.	°	°	°
11.5	71·6	62·4	102·2
11.11	72·2	63·4	100·2
11.41	71·7	62·0	98·2
p.m.			
0.11	70·0	61·0	88·0
0.41	70·9	61·2	93·8
1.11	73·2	62·0	111·6
1.21	74·9	63·0	114·6
2.14	74·6	62·4	112·7

[ED. *S.M.M.*]

LUNAR RAINBOWS.

A LUNAR Rainbow, visible on two successive evenings, must form an event of considerable rarity, and I cannot recall a parallel case during an observational experience extending from 1865.

On Sunday, August 2nd, at about 10.40 p.m., after a slight shower the gibbous moon broke through a rift and a pretty complete and

distinct bow formed upon dark clouds in the northern sky, and was observed by many persons at Horfield, a northern suburb of this city. It soon faded and was reduced to a fragment at the end. Moon's age, 10 days, 20 hours. Declination, S. 28°. Altitude 9°.

On Monday, August 3rd, there was a heavy storm of rain at 10 p.m. and later, but it soon abated and the sky began to clear from west at about 10.20 p.m. The moon shone brightly through an opening and as the sprinkling drops from the receding storm were still falling a bright lunar bow became vividly projected upon the heavy northern clouds. It remained but a brief period but caused much comment among interested spectators, many of whom had never viewed such a novelty. Moon's age 11 days, 19 hours. Declination S. 26½°. Altitude 12°.

On August 7th, 10.10 to 10.15 p.m. there was a "mock moon" or paraselene. It formed on a thin white cloud at same altitude as the moon and about 23 degrees to the E. of her. At first there was a faint ascending ray from the paraselene; near the end the ray flowed horizontally eastwards. For several minutes the appearance was very similar to that of the moon, showing dimly through a cloud and it formed quite a striking phenomenon. Halves and fragments of haloes were observed before and after the paraselene, in fact there was much thin filmy cloud over the sky and of a character which frequently produces the features described.

W. F. DENNING.

Horfield, Bristol, August 10th, 1914.

SOLAR HALO.

A BEAUTIFUL solar halo was visible here on Friday, June 26th, from 8.30 to 9 a.m. At 8.30 the circle was complete with a radius of about 22°, brilliantly coloured, with red nearest the sun; at 8.45 taking the form of an arc above the sun, in a N.W. direction with slightly larger radius, and very vivid colours, the whole disappearing at 9 a.m. The sky was half covered with cirro-stratus from N.W., and a few cirri from N.E., the wind being N.E., force 2. This was preceded by a minimum in screen of 37°, and 35° on the grass, the lowest we have had in June for several years. The barometer at the time was standing at 30·433 in., and the weather for the rest of the day was very fine and hazy with the max. in screen reaching 70°.

F. LOWE.

S. Michael's, Tenbury, Worcestershire, June 29th, 1914.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

September 14th, 1911.

Starting Point.	Country.	A (Hc.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles	F
Manchester	England ..	5·9	—47	10·0	—38	61	E.
Pyrton Hill.....	,, ..	6·3	—58	11·9	—51	72	E.N.E.
,, 6.47 p.m.	,, ..	7·3	—73	9·4	—65	60	E.
Petersfield	,, ..	6·3	—63	11·9	—53	77	E. by N.
Brussels	Belgium ..	6·9	—78	9·6	—72	80	S.S.E.
Hamburg.....	Germany..	7·6	—69	7·7	—68	84	E. by N.
Lindenberg.....	,,	6·9	—76	8·7	—69	78	E.N.E.
Paris.....	France	...	...	6·9	—76	94	E.N.E.
Strassburg	Germany ..	8·3	—80	10·1	—65	63	E.N.E.
Munich	,, ..	7·9	—77	10·7	—67	42	E.N.E.
Vienna.....	Austria	7·5	—67	9·4	—50	26	N.E. by E.
Pavlovsk.....	Russia	6·7	—75	10·2	—60	84	S. by E.

September 15th, 1911.

Crinan	Scotland ..	5·7	—54	9·4	—54	68	S. by W.
Manchester.....	England ..	5·9	—61	11·3	—56	54	E.S.E.
Pyrton Hill.....	,, ..	6·9	—62	12·5	—54	35	E. by S.
Petersfield	,, ..	6·6	—59	9·4	—55	53	E.
Paris.....	France ...	7·0	—69	8·8	—62	56	E. by N.
Strassburg.....	Germany ..	7·0	—69	10·8	—64	46	E. by N.
Munich	,, ..	7·5	—76	9·1	—72	67	N.E.
Vienna.....	Austria ..	7·6	—92	8·3	—69	...	...
Pavia	Italy	7·3	—81	9·7	—42	112	NE. by N.
Pavlovsk.....	Russia	6·9	—51	11·3	—49	84	E.N.E.
Nizhni Olchedaeff	,, ..	6·9	—78	8·9	—66	38	E.N.E.

September 16th, 1911.

Brussels	Belgium ..	6·7	—62	16·3 ?	—60	51	E. by S.
Hamburg	Germany..	5·6	—48	8·3	—58	16	S.E.
Strassburg	,, ..	7·2	—67	9·2	—62	46	E.N.E.
Munich	,, ..	7·3	—67	10·9	—62	54	E.N.E.
Vienna.....	Austria ..	6·7	—70	8·3	—60	38	E.
Pavia	Italy.....	7·5	—75	10·2	—61	84	E.
Pavlovsk.....	Russia	7·1	—48	11·0	—51	38	E.S.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On September 14th a low pressure area lay over the Gulf of Finland, and a high pressure stretched across the North Atlantic, from Ireland to Greenland. Similar conditions held on the 15th, but the anticyclone over the Atlantic was more to the south. On the 16th the low pressure had removed to the east and another low pressure had appeared over Iceland.

A very steady and general drift of air towards the East is shown on each day, although the barometric gradients seemed in favour of a north to south flow. Considerable discrepancies are shown in the temperatures, possibly some of them instrumental, the —38 at Manchester on the 14th, and the —42 at Pavia on the 15th, are much beyond the usual range, and are perhaps due to solar radiation. On the other hand the —92 at Vienna is very low, especially when the date and height of the barometer is taken into account.

REVIEW.

Ninth Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury, for the year ended March 31st, 1914. London, H.M. Stationery Office. Size 9½ × 6, pp. 69. Price 4d.

THE ninth annual report of the Meteorological Committee dealing with the year 1913-14, the fifty-ninth year of the existence of the Meteorological Office, is altered in form by the omission of the detailed lists of stations and of institutions supplying meteorological data which are published separately. The activity of the Meteorological Office continues to increase, both in the direction of the organization of the various departments with which it deals and in the prosecution of meteorological research.

The staff of the Office has been strengthened during the year by the appointment of a number of junior professional assistants who are all University graduates. Among other important branches of the work, it is thus hoped to make more rapid progress with the co-ordination of meteorological statistics from various parts of the globe. Other research forwarded by this means has been the discussion of the observations of Captain Scott's Second Antarctic Expedition and the preparation of a report on ice in the Atlantic for the Board of Trade.

It is announced that the contribution hitherto made towards the expense incurred by the Scottish Meteorological Society in collecting and editing meteorological returns, has been increased to £450 per annum, and that a branch Meteorological Office has been instituted in Edinburgh for the purpose of dealing with local meteorological records and research. The superintendent of this branch is at the same time the Secretary of the Scottish Meteorological Society.

An appendix gives particulars of the absolute units recently adopted by the Meteorological Office for use in the Daily Weather Report, and explains in detail the reasons which gave rise to the change, the principal object being that of advancing towards a set of units common to all nations. Together with the adoption of absolute units for temperature readings, and the percentage barometer, the metric system has been introduced for recording rainfall.

METEOROLOGICAL NEWS AND NOTES.

MR. R. C. MOSSMAN, who acted as Editor of this Magazine from the issue of November, 1913, to that of August, 1914, has decided to return to his duties in South America, and with the present number Dr. H. R. Mill resumes the editorship. Our readers will, we are sure, join us in thanking Mr. Mossman for his capable and conscientious labours during the last ten months, and we are sure that never in recent years has the Magazine been so well catered for as under his charge. The work has been so well done that it places us in no little difficulty to maintain the standard he has set. This difficulty is increased by the necessity imposed by the economic results of the War, to reduce the size of each number for the present, a reduction we make most reluctantly, and hoping that it will not be for long.

THE METEOROLOGICAL NOTES hitherto occupying the penultimate page of each issue, have been fused this month with the article on the Weather of the Month. This has been done primarily in the effort to minimize the effect of the reduction of the size of the Magazine from 20 to 16 pages, made necessary by the sudden fall in the income of the British Rainfall Organization on account of the war. We hope, however, that the new arrangement may commend itself to our readers, for it avoids a certain amount of overlapping of information, and enables us to incorporate the results obtained by a greater number of Observers than was possible when the individual remarks from a few stations only were quoted. We earnestly hope that none of the monthly Observers, who favour us with remarks on weather, will consider that these are less appreciated, although utilized in a new form.

THE DAILY WEATHER REPORT of the Meteorological Office, as issued during the past few weeks, reflects in an interesting manner the progress of events in Europe. The earliest symptoms of interference may be seen in the absence of the Vienna observations on July 26th, followed on the 27th by St. Petersburg, and on August 1st by Berlin. During the next few days the German stations disappeared one by one from the list. Swedish records also failed on the 1st, and all the Scandinavian ones on the 7th. From the 4th, part of the French records, including Belfort, were absent, on the 5th the Faroes and Southern Europe were cut off. Brussels appeared regularly till the 16th, but from the 17th to 22nd the Continent was practically unrepresented. The French observations mostly re-appeared on the 23rd, and on September 5th the Norwegian records brought back something of the customary appearance of the *Daily Weather Report*.

ERRATUM.—In August number, page 126, line 28, *for* "were uniformly" *read* "were not uniformly."

RAINFALL TABLE FOR AUGUST, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·39	1·24
Tenterden	*Kent*	51 4	*0 41	190	2·42	1·30
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·52	1·71
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·85	2·75
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·44	2·01
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·38	...
Shoeburyness	*Essex*	51 31	*0 48	13	1·74	·32
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·52	·79
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·22	·81
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·17	2·62
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·84	2·96
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·90	1·44
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·43	3·77
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·81	1·93
Boston	*Lincolnshire*	52 58	0 1	11	2·39	1·67
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·55	1·41
Macclesfield	*Cheshire*	53 15	2 7	501	3·70	4·26
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	3·73	1·64
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	5·62	3·03
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·78	2·39
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	3·05	2·44
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·20	1·61
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·47	8·86
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·54	3·83
Haverfordwest	*Pembroke*	51 48	4 58	90	4·21	7·37
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·88	4·12
Llandudno	*Carnarvon*	53 20	3 50	72	3·16	1·29
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·23	...
Marchmont House	*Berwick*	55 44	2 24	498	3·54	2·17
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·54	5·48
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·62	2·76
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·02	6·31
Mull (Quinish)	,,	56 34	6 13	35	5·00	4·53
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	3·34	2·68
Braemar	*Aberdeen*	57 0	3 24	1114	3·63	1·88
Aberdeen (Cranford)	,,	57 8	2 7	120	3·07	1·12
Cawdor	*Nairn*	57 31	3 57	250	3·05	2·12
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·52	3·03
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·61	7·72
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·71	2·05
Wick	*Caithness*	58 26	3 6	77	2·73	1·60
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·57	5·04
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·73	5·23
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	4·04	4·87
Ennistymon House	*Clare*	52 57	9 18	37	5·01	6·49
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·31	3·75
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·94	4·88
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	3·08	3·22
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	4·00	6·00
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·68	3·19
Cong (The Glebe)	,,	53 33	9 16	112	4·70	4·89
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·30	5·39
Seaforde	*Down*	54 19	5 50	180	3·64	4·02
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	4·06	4·08
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	4·22	4·07

RAINFALL TABLE FOR AUGUST, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
—1·15	52	·52	5	9	15·92	13·63	—2·29	86	25·11	Camden Square
—1·12	54	·45	26	13	16·07	16·41	+ ·34	102	27·64	Tenterden
— ·81	68	·50	15	12	17·44	17·54	+ ·10	101	30·48	Patching
— ·10	96	·53	16	15	18·58	20·27	+1·69	109	31·87	Cadland
— ·43	82	·90	4	13	15·47	15·67	+ ·20	101	24·58	Oxford
...	...	...	...	...	16·06	...	..	...	25·17	Croyland Abbey
—1·42	18	·14	5	9	11·47	10·84	— ·63	95	19·28	Shoeburyness
—1·73	31	·19	1	9	15·96	14·61	—1·35	92	25·40	Westley
—1·41	37	·30	20	10	14·20	12·93	—1·27	91	23·73	Geldeston
— ·55	83	·72	14	16	21·79	27·66	+5·87	127	38·27	Polapit Tamar
+ ·12	104	·85	14	13	19·85	24·45	+4·60	123	33·54	Rousdon
—1·46	50	·31	25	15	18·73	18·25	— ·48	97	29·81	Stroud
+ ·34	110	1·74	1	15	20·31	20·38	+ ·07	100	32·41	Wolstaston
— ·88	69	...	...	...	18·16	13·45	—4·71	74	28·98	Coventry
— ·72	70	·35	21	11	14·60	12·26	—2·34	84	23·35	Boston
—1·14	55	·42	9	14	15·70	11·77	—3·93	75	24·46	Hodsock Priory
+ ·50	113	·74	2	17	21·93	24·14	+2·21	110	34·73	Macclesfield
—2·09	44	·57	8	13	19·61	17·37	—2·24	89	32·70	Southport
—2·59	54	·72	2	14	37·59	34·94	—2·65	93	61·49	Arncliffe
— ·39	86	·60	3	9	16·97	15·56	—1·41	92	26·87	Ribston Hall
— ·61	80	·73	24	13	16·52	14·14	—2·38	86	26·42	Hull
—1·59	50	·49	2	13	17·65	15·94	—1·71	90	27·94	Newcastle
—2·61	77	4·71	8	14	76·76	78·97	+2·21	103	129·48	Seathwaite
— ·71	84	·89	25	17	25·02	31·01	+5·99	124	42·28	Cardiff
+3·16	175	1·15	25	17	27·05	30·73	+3·68	114	46·81	Haverfordwest
— ·76	84	·73	25	17	27·03	30·48	+3·43	113	45·46	Gogerddan
—1·87	41	·43	25	9	18·05	17·02	—1·03	94	30·36	Llandudno
...	...	...	...	...	26·49	...	...	...	43·47	Cargen
—1·37	61	·37	2	13	21·22	16·25	—4·97	77	33·76	Marchmont
+ ·94	121	1·12	9	17	29·37	33·25	+3·88	113	49·77	Girvan
— ·86	76	·57	8	16	22·04	21·06	— ·98	96	35·97	Glasgow
+ ·29	105	1·28	8	19	40·06	44·12	+4·06	110	68·67	Inveraray
— ·47	91	1·05	23	18	32·67	33·18	+ ·51	102	56·57	Quinish
— ·66	80	·61	2	15	18·20	15·68	—2·52	86	28·64	Dundee
—1·75	52	·81	2	13	21·43	20·87	— ·56	97	34·93	Braemar
—1·95	37	·26	3	11	20·09	16·69	—3·40	83	32·73	Aberdeen
— ·93	70	·75	1	9	18·70	17·02	—1·68	91	29·33	Cawdor
— ·49	86	·69	23	17	26·72	23·88	—2·84	89	44·53	Fort Augustus
+1·11	117	1·61	23	17	49·51	59·70	+10·19	121	83·93	Bendamph
— ·66	76	·85	2	13	19·90	19·33	— ·57	97	31·90	Dunrobin Castle
—1·13	59	·63	2	18	18·11	17·10	—1·01	94	29·88	Wick
+ ·47	110	1·17	23	20	32·97	39·82	+6·85	121	54·81	Killarney
+1·50	140	1·37	14	19	24·26	24·28	+ ·02	100	39·57	Waterford
+ ·83	121	·97	23	19	24·57	25·47	+ ·90	104	39·43	Castle Lough
+1·48	130	1·30	1	21	28·25	33·71	+5·46	119	46·52	Ennistymon
+ ·44	113	1·35	25	14	21·63	21·02	— ·61	97	34·99	Courtown Ho.
+ ·94	124	1·05	14	18	22·77	23·79	+1·02	104	35·92	Abbey Leix
+ ·14	105	1·00	14	17	17·83	14·46	—3·37	81	27·68	Dublin
+2·00	150	2·35	14	20	23·17	24·42	+1·25	105	36·15	Mullingar.
—1·49	68	·56	7	20	31·32	32·96	+1·64	105	52·87	Enniscoe
+ ·19	104	·74	22	19	29·83	33·39	+3·56	112	48·90	Cong
+1·09	125	1·18	14	20	26·49	30·06	+3·57	114	42·71	Markree
+ ·38	110	·70	26	17	24·38	21·63	—2·75	89	38·91	Seaforde
+ ·02	100	·92	1	18	22·83	21·50	—1·33	94	37·56	Dundarave
— ·15	96	·65	23	17	24·66	25·29	+ ·63	103	39·38	Omagh

SUPPLEMENTARY RAINFALL, AUGUST, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	1·71	XI.	Lligwy	1·60
,,	Ramsgate	·70	,,	Douglas	3·89
,,	Hailsham	·99	XII.	Stoneykirk, Ardwell House...	4·21
,,	Totland Bay, Aston House...	2·08	,,	Dalry, The Old Garroch	6·01
,,	Stockbridge, Ashley..	2·79	,,	Beattock, Kinnelhead	5·24
,,	Grayshott	1·67	,,	Langholm, Drove Road	5·18
III.	Harrow Weald, Hill House...	1·08	XIII.	Meggat Water, Cramilt Lodge	3·51
,,	Caversham, Rectory Road ...	2·04	,,	North Berwick Reservoir	2·42
,,	Pitsford, Sedgebrook...	1·55	,,	Edinburgh, Royal Observaty.	1·48
,,	Woburn, Milton Bryant.	1·29	XIV.	Maybole, Knockdon Farm ...	3·71
,,	Chatteris, The Priory	1·78	XV.	Ballachulish House	...
IV.	Elsenham, Gaunts End	·89	,,	Campbeltown, Witchburn ..	3·97
,,	Colchester, Hill Ho., Lexden	·61	,,	Holy Loch, Ardnadam	7·67
,,	Ipswich, Rookwood, Copdock	1·14	,,	Islay, Eallabus	6·05
,,	Blakeney	2·98	,,	Tiree, Cornaigmore	4·30
,,	Swaffham ..	1·32	XVI.	Dollar Academy	3·97
V.	Bishops Cannings	2·94	,,	Balquhidder, Stronvar..	5·05
,,	Wimborne, St. John's Hill ...	3·76	,,	Glenlyon, Meggernie Castle..	4·48
,,	Ashburton, Druid House.. ..	3·91	,,	Blair Atholl	3·09
,,	Cullompton	3·19	,,	Coupar Angus	2·51
,,	Lynmouth, Rock House	3·46	,,	Montrose, Sunnyside Asylum.	1·51
,,	Okehampton, Oaklands.. ...	3·44	XVII.	Alford, Lynturk Manse	2·07
,,	Hartland Abbey	5·32	,,	Fyvie Castle	1·87
,,	Probus, Lamellyn	1·81	,,	Keith Station ..	2·50
,,	North Cadbury Rectory	2·66	XVIII.	Rothiemurchus	2·58
VI.	Clifton, Pembroke Road	2·91	,,	Loch Quoich, Loan	14·10
,,	Ross, The Graig	1·42	,,	Drumnadrochit	1·87
,,	Shifnal, Hatton Grange.	1·96	,,	Skye, Dunvegan	5·62
,,	Droitwich	1·87	,,	Lochmaddy, Bayhead	3·38
,,	Blockley, Upton Wold	1·46	,,	Glencarron Lodge	7·12
VII.	Market Overton	1·52	XIX.	Inversnin	1·59
,,	Market Rasen	1·39	,,	Melvich	3·12
,,	Bawtry, Hesley Hall	1·99	,,	Loch Stack, Ardchullin	4·45
,,	Derby, Midland Railway	1·64	XX.	Skibbereen Rectory	4·45
,,	Buxton	4·56	,,	Dunmanway, The Rectory ..	6·15
VIII.	Nantwich, Dorfold Hall	2·84	,,	Glanmire, Lota Lodge, No. 1	3·90
,,	Chatburn, Middlewood	2·46	,,	Mitchelstown Castle	3·39
,,	Cartmel, Flookburgh	...	,,	Darrynane Abbey	6·43
IX.	Langsett Moor, Up. Midhope	1·86	,,	Clonmel, Bruce Villa	4·56
,,	Scarborough, Scalby	2·74	,,	Newmarket-on-Fergus, Fenloe	5·62
,,	Ingleby Greenhow	1·24	XXI.	Laragh, Glendalough	4·37
,,	Mickleton	1·70	,,	Ballycumber, Moorock Lodge	5·13
X.	Bellingham, High Green Manor	2·40	,,	Balbriggan, Ardgillan ..	3·28
,,	Ilderton, Lilburn Cottage ...	2·12	XXII.	Woodlawn	4·42
,,	Keswick, The Bank	3·20	,,	Westport, St. Helens	3·14
XI.	Llanfrechfa Grange	2·41	,,	Dugort, Slievemore Hotel ..	4·78
,,	Treherbert, Tyn-y-waun	7·63	,,	Mohill Rectory	5·93
,,	Carmarthen, The Friary	4·54	XXIII.	Enniskillen, Portora	...
,,	Castle Malgwyn [Llechryd]...	2·90	,,	Dartrey [Cootehill]	4·49
,,	Crickhowell, Tal-y-maes	3·50	,,	Warrenpoint, Manor House	3·39
,,	New Radnor, Ednol	3·63	,,	Banbridge, Milltown	2·62
,,	Birmingham WW., Tyrmynydd	4·37	,,	Belfast, Cave Hill Road	3·55
,,	Lake Vyrnwy	3·92	,,	Glenarm Castle	...
,,	Llangyhanfal, Plâs Draw	1·21	,,	Londonderry, Creggan Res...	3·21
,,	Dolgelly, Bryntirion	4·19	,,	Dunfanaghy, Horn Head ...	3·03
,,	Bettws-y-Coed, Tyn-y-bryn...	3·52	,,	Killybegs	4·34

THAMES VALLEY RAINFALL. —— AUGUST, 1914.

THE WEATHER OF AUGUST.

DURING the first week a depression whose centre hovered between the British Isles and Iceland caused southerly or south-westerly winds to predominate, accompanied by rather low day temperatures and a good deal of rain. On the 1st there was 1·74 in. of rain at Wolstaston, of which 1·08 in. fell in an hour, between 6 and 7 p.m. More than 1 inch fell at many widely distributed stations throughout the Kingdom. A secondary depression travelled from the south-west of England to the North Sea on the 4th and 5th, bringing heavy rain, the highest falls reported being 1·48 in. at Goring and 1·43 in. at Surbiton, both on the 5th. Unsettled conditions continued and on the 8th heavy rain fell over the north-west of England and south-west of Scotland. Several stations had over 2 inches, and at Sawrey there was 3·31 in., at Dungeon Ghyll 3·55 in. and at Seathwaite 4·71 in. At Blaenau Festiniog the reading for the 8th was not taken, but for the 2 days 8th and 9th the fall was 5·48 in. At many stations the lowest temperature of the month also occurred on the 8th, minimum values of 42° being reported at Marlborough and Llangammarch Wells, 41° at Buxton, and 37° at Balmoral. An anticyclonic system spread over the Kingdom from the Atlantic on the 11th, causing fair or fine weather with a rise in temperature. On the 14th a shallow depression over the south of Ireland and the south-west of England was accompanied by severe thunderstorms and heavy rain, and, in some places, hail. At Mullingar 2·35 in. of rain was measured, at Castledermot 2·85 in., at Gillardstown 2·95 in., and at Packenham Hall 3·22 in. Many stations in Devon had about 1·50 in. on the 14th, and less heavy falls on the 15th. On the 16th the anticyclone which had previously moved away from these Islands in a north-easterly direction, expanded southwards again and occasioned a renewal of fair, dry weather over the entire country. Rain fell in most of the western and northern districts on the 20th, and thunderstorms or thunder only occurred in nearly all parts of Great Britain on the 21st. In the week following the distribution of pressure was mainly cyclonic, and the weather was, therefore, of a generally unsettled character. Between the 23rd and 26th heavy rain, frequently accompanied by thunder and lightning, was experienced in many places in the west and north of the British Isles. The largest falls on the 23rd were 1·61 in. at Bendamph, and 1·17 in. at Killarney and Dunmanway. On the 24th there was 1·82 in. at Filey and 1·55 in. at Lowthorpe. Many places in Ireland, Wales, and the west of Scotland had over 1 inch on the 25th, the greatest falls being 1·67 in. at Blaenau Festiniog and 1·35 in. at Courtown (Co. Wexford). Unusual warmth prevailed during the last 10 days, the maximum temperatures being generally recorded on 23rd or 24th. Over 70° was recorded in practically all districts, except the north of Scotland, and readings above 80°

occurred in the east and south-east of England, the highest being 82° at Norwich and Raunds, 84° at Greenwich, and 86° at Camden Square. Very little rain fell in the last few days, except in the south-east of Ireland, where several stations had upwards of 1 inch of rain on the 29th.

In London the conditions were fair to showery in the first ten days of the month, after which the weather was generally sunny and warm with but little rain. The mean temp., 64°·2, was 1°·9 above the average. The duration of sunshine was 167·5 hours, and of rain 21·9 hours.

The general rainfall over the Kingdom as a whole, expressed as a percentage of the average, was as follows :—England and Wales, 75 : Scotland, 85 ; Ireland, 114 ; British Isles, 89.

Climatological Table for the British Empire, March, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	65·5	31	28·4	11, 22	51·1	37·9	39·3	85	108·7	22·4	4·51	25	6·6
Malta	68·0	22	46·5	4, 5	60·8	53·1	...	83	126·5	..	1·11	8	1·5
Lagos	91·0	3, 10	73·0	27, 30	89·0	77·1	75·3	76	160·0	70·0	3·13	8	6·1
Cape Town	95·1	1	46·4	26	78·7	58·5	56·4	68	...	...	·33	4	3·5
Natal, Durban ...	79·0	4	63·0	15	75·9	68·5	67·7	79	...	...	5·74	14	5·0
Johannesburg	80·5	30	45·4	9	74·6	55·0	52·4	72	..	43·8	2·93	10	3·7
Mauritius	89·8	10	67·9	7	85·2	73·1	72·4	82	...	60·4	8·83	18	6·1
Bloemfontein ...	88·6	11, 12	47·9	27	81·7	57·1	53·7	85	...	...	1·69	9	2·4
Calcutta...	100·1	30	62·5	6	91·4	70·3	64·1	61	...	57·7	·37	1	2·3
Bombay...	87·4	31	67·5	14	84·6	72·0	67·8	78	134·8	56·7	...	...	1·0
Madras	96·1	11	68·3	4	90·4	73·9	71·6	74	157·6	65·8	·00	0	1·3
Colombo, Ceylon ...	92·1	26, 28	71·1	6	89·3	74·0	73·3	78	158·0	67·1	3·80	9	5·1
Hongkong	82·3	9	49·5	17	71·7	63·5	62·4	83	...	...	1·19	6	7·7
Sydney	83·0	19	59·9	4	76·3	65·1	62·0	77	143·0	53·5	11·00	25	6·1
Melbourne	95·7	11	46·6	18	76·8	58·9	53·9	61	153·4	40·7	1·69	5	4·4
Adelaide	101·5	6	51·3	30	83·6	62·1	52·5	48	157·4	40·8	1·09	5	3·5
Perth	106·1	6	50·0	11	80·5	59·9	53·6	55	164·0	43·5	·03	3	3·0
Coolgardie	99·0	3	46·0	27	86·1	58·9	50·2	43	165·0	42·0	·23	1	2·4
Hobart, Tasmania .	89·3	9	44·0	17	69·0	53·4	50·9	63	136·7	39·6	1·25	15	6·3
Wellington ...	77·0	28	43·4	10	66·7	55·1	53·0	75	137·0	31·0	2·32	16	6·9
Auckland	77·0	4, 28	49·0	22	71·9	57·4	56·5	75	150·0	45·0	2·22	6	5·0
Jamaica, Kingston .	...	...	..	...	...	...	...	...	...	...	...	...	...
Grenada	89·0	4	70·0	10	83·7	73·1	...	71	136·0	...	2·61	13	2·5
Toronto	55·2	16	4·5	2	37·6	23·8	23·8	82	62·3	1·6	2·42	11	6·4
Fredericton	47·5	27	3·0	14	37·7	3·0	...	80	...	...	3·90	13	6·2
St. John, N.B. ...	49·2	27	8·5	21	36·6	25·5	24·0	74	...	...	2·34	15	6·5
Edmonton, Alberta ...	59·1	13	-12·6	26	37·1	18·8	...	68	113·2	-20·1	·48	11	5·8
Victoria, B.C.	68·1	20	29·4	26	53·3	40·5	39·0	76	...	...	2·05	14	5·9

Symons's
Meteorological Magazine.

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WEATHER IN THE SEVENTEENTH CENTURY
(LAST QUARTER).

By Walter Sedgwick.

II.—Harvest and Autumn.

In this article further extracts are given from the Diary kept by the Rev. Wm. Sampson, Rector of Clayworth, Notts., during the last quarter of the Seventeenth Century. In Part I. of this series (see this Magazine for August, 1914), information was given about Mr. Sampson and his "Rector's Book," from which the extracts are taken, and also about the situation of Clayworth, where he lived. It might have been added that Mr. Sampson was President of Pembroke College, Cambridge, from 1672 till 1675, and was elected in 1692 to the more responsible Office of Master of the College, which Office, however, he declined. These facts show that the Rector was a man of considerable standing.

Part I. of the series dealt with the Weather during the period of the year April 4th to July 31st N.S. This part covers the months of August, September, and October N.S.

The notes made by Mr. Sampson referring directly to the weather during these three months are very few, but he has entered in his Diary nearly every year some information about the character of the harvest or the dates when it began and ended. Thus he has given indirectly a fair indication of the weather experienced about harvest time during his 25 years' residence at Clayworth. Even as regards the harvests it is impossible always to be positive as to whether they were early or late, short or prolonged, as it is not always clear whether the Rector is referring to harvest generally or to corn harvest only; again, in some years he states the date when harvest began and in others the date when the tything men entered the fields. The actual date of the commencement of harvest is mentioned in seven years, and varies from July 30th, in 1676, to August 17th, in 1701; the average date being August 8th. The date when the tything operations were commenced is also mentioned

in seven years, and varies from August 9th, in 1691, to August 27th, in 1692; the average date being August 18th. It is impossible to state exactly how many days should be allowed between the date of commencement of harvest and the date when the tything men entered the fields, but, if a period of from 10 to 14 days is right, the average date for the commencement of harvest at Clayworth during this quarter of a century would be about August 5th to 7th. The dates at which the harvest ended is mentioned in 14 years and, as might be expected, varies considerably from year to year, ranging from August 31st, in 1684, to October 20th, in 1696; the average date for the end of harvest being about September 22nd. Assuming the average dates for the commencement and ending of harvest mentioned above to be correct, the variations in the time of harvest during the quarter of a century under review, are shewn in the following table :—

Year	1676	1677	1678	1679	1680	1681	1682	1683	1684
Commencement	V.E.	L.	Av.	...	Av.	Av.	L.	E.	E.
End	...	...	V.E.	Av.	Av.	L.	Av.	Av.	V.E.

Year	1690	1691	1692	1693	1695	1696	1698	1699	1700	1701
Commencement	...	V.E.	V.L.	Av.	...	L.	...	Av.	...	V.L.
End	E.	Av.	...	...	V.L.	V.L.	V.L.	E.	L.	Av.

Av. — Average. E. — Early. L. — Late. V. — Very.

It will be noticed that the period covered by the Diary starts with 9 years (1676 to 1684) in which harvests are for most part early, then follow six years when no information is given, then two more years (1690 to 1691) when the harvest was early, and then a sequence of 10 years (1692 to 1701) when the 8 harvests mentioned are all late or very late, with two exceptions. The latest and most prolonged of these harvests was that of 1696. The harvest of 1692 also began very late, in consequence, no doubt, of the extremely wet summer which was experienced that year at Clayworth (see this Magazine for August, 1914), as indeed also in London and over England generally, according to John Evelyn (see this Magazine, Vol. **46** page 110). Evelyn refers also to the unseasonable weather during the summer of 1696, but adds in September that there was "a great harvest after a cold wet summer."

The considerable difference between the average dates for the beginning and end of harvest during the last ten years covered by Mr. Sampson's Diary, as compared with the first ten years, seems to point to a somewhat marked short periodic variation in the general character of the weather in the neighbourhood of Clayworth during the summer months. Apart from the information given by Mr. Sampson about the dates of harvesting, there is little in the extracts at the end of this article which calls for comment. For the most

part Mr. Sampson's notes on the weather during the three months of August, September, October, relate to the frequency of rain in the late Autumn, particularly in October, accompanied, in many years by stormy weather and strong winds. One year, 1694, there was snow in the latter part of October.

NOTE.—In the following extracts the dates both in the margin and text have been corrected to New Style, except in cases under the heading "Seasons." In these cases it has been found more convenient not to alter the language of the Diary, but where possible the corrected dates in New Style are given in brackets.

Dates. New Style.

1676.		Harvest began, July 30th.
1677.		Harvest began, August 13th.
		Seasons.—In harvest fine and dry.
1678.		Barley harvest began, August 8th. Pease harvest ended, September 3rd.
		Seasons.—We had a fair and dry harvest.
1679.		Harvest in, September 23rd.
	October	26. Rains most of the three weeks last past.
1680.		Tything men entered the fields, August 16th; white corn all gotten in, August 31st; Harvest in, September 18th.
		Seasons.—A very wet time about Autumn.
	October	3. A very sickly time.
1681.		Entered the fields for tything, August 16th; Harvest ended, October 2nd.
1682.		Harvest began, August 12th, ended, September 23rd.
		Seasons.—Corn was generally well gotten. A great fitch year, but beans and peas very indifferent.
1683.		Harvest began, August 3rd. ended, September 21st.
1684.		Harvest began, August 1st, ended August 31st.
		Seasons.—The latter end of August, viz., from the 12th (22nd) was rainy.
1685.		*Seasons.*—The harvest was wet, which caused our wheat to sprout.
1688.		*Seasons.*—August 9th (19th) etc., very dry and droughty.
1689.		Tything men entered the fields, August 12th, and we got all in, September 13th.
		Seasons.—In the declension of October fell great rains, which set the waters everywhere much out.
1690.	August	11. Began watery weather after a long drought.
		Harvest in, September 5th.
1691.		Tything men entered the white corn field, August 9th.
	September	16. Just when harvest was in fell rains again.
1692.		*Seasons.*—In August from 7th to 25th (August 17th to September 4th) the ways were so sobbed that it cost 15s. to make the way . . . . . passable.
		Tything men entered the fields, August 27th; all the wheat was in by the end of August.

	September	18 An earthquake not took notice of here, but felt in divers parts of England; in London about 12 o'clock. It lasted not above one minute.
	October	30. Rains set in apace.
1693.		Tything men entered the fields, August 17th, and finished not white corn until the end of the month (September 10th). *Seasons.*—August, rains delay our harvest.
1694.	August	16th, windy and rainy; 30th, the rains slacken harvest.
	September	15th and 16th, the winds throw down much fruit; 29th, rains after drought.
	October	6th and 7th, strong winds again which throw down much more fruit, yet a great apple year after all; 19th, Rains after drought; 23rd, snow and sharp wind; 27th, a great wind; 30th and 31st, and November 1st, snowy.
1695.	September	5th, it continued raining from the 24th August to this day; 12th, rain with a fierce wind the night following did much hurt to fruit and at sea; 18th, it rained all day. White corn all in at Wyeston, September 17th, and at Clayworth, September 22nd. Pease harvest not all in till October 14th.
	October	31st, misty and foggy.
1696.		Tything men entered the fields, August 25th, and took not their farewell of them till the 20th October following. A general scarcity of fruit this year by reason of a great blast in the Spring.
	August	29th, rain all day.
	September	6th, rain most of the day; 7th, wet still hinders harvest; 18th, rains interrupt harvest; 29th, harvest still halts through lowering weather to the 10th October.
	October	20th, harvest at last ended; 31st, stormy, winds and rain.
1697.		*Seasons.*—In September and October abundance (of fruit) thrown down.
1698.		*Seasons.*—July 30th (August 9th), wind and storm; August, rains obstruct and retard harvest; September, rainy and windy; October, dropping weather most of this month. White corn not in till October 4th. Pease inned about middle of October.
1699.		Tything men entered the fields August, 17th; upon the 30th white corn was all got in and on September 8th, pease also. *Seasons.*—August begins dropping, but after, good harvest weather; September, towards later end high winds throw down fruit; October, drought to the 12th (22nd) after that fell rain to the end of the month.
1700.	August	5th and 10th, rains.
	September	3rd and 8th, rainy; 20th, showery; 28th, rains retard harvest.
	October	8th, much rain in the night; 15th, we got fruit lest the winds do it for us; 26th and 27th, sore rainy days.

1701.	August	13th, great shower, afternoon; 17th, thunder, lightning, and rain; 19th, watery weather; 21st, showery and windy; 28th, good harvest day; 31st, very hot.
	September	9th, a furious wind.
	October	1st, very rainy after a month's drought; 4th, rain all morning; 7th, rain sends labourers out of the field; 14th, furious wind with rain and hail from south-west.

Harvest began, August 17th, and ended, September 22nd.
Fruit first blasted and what was not so, eaten with worms in the Spring, and what was left of both, in the Autumn generally thrown down with winds.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

October 5th, 1911.

Starting Point.	Country.	A (H_c) miles.	B (T_c) ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill.....	England ..	6·3	—58	11·6	—61	85	S.W.
Brussels	Belgium ..	5·4	—52	12·4	—62	26	W.N.W.
Hamburg.....	Germany..	5·5	—57	6·3	—58	12	N.W.
Lindenberg.....	,,	6·4	—63	7·4	—64	23	N.E.
Paris.....	France....	7·5	—59	9·2	—67	17	N.W.
Munich	Germany..	7·0?	—63	7·4	—66	81	N.E.
Vienna.....	Austria ..	6·4	—78	7·2	—71	63	E.N.E.
Pavia	Italy	7·7	—74	11·9	—70	86	NE.
Nizhni Olchedaeff	Russia	7·3	—66	7·9	—72	76	E. by N.
Ekaterinburg....	Siberia....	...	...	7·4	—72	78	E.S.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

An extensive depression stretched from France to N.E. Europe with local minima over the west of France and the Mediterranean, with a high-pressure area between England and Iceland.

The value of H is very indefinite at the western stations. The drift of the balloons to the west in the western part and to the north-east in the eastern part of the area is remarkable.

RAINFALL AND YIELD OF WATER.

THE following is an abstract from "Notes on the Relation between Rainfall and Yield," by D. Halton Thomson, M.A. (Cantab.), Assoc.M.Inst.C.E., published in "Engineering," September 4th, 1914 :—

The purpose of this article is to suggest a development of the common method of ascertaining the relation between Rainfall and Yield by plotting the one against the other and by drawing among the points thus obtained a straight line to represent this relation. Experience shows that the points usually distribute themselves in so haphazard a manner that it is difficult to determine the best position for this line. The reasons for the irregularity fall under three heads.

In the first place, apart from actual errors of observation, the rainfall may be derived from the records of only a few gauges, or even one gauge, so placed as not to be fairly representative of the drainage area; or the yield may be calculated from a weir-gauge, the rating of which is open to question. The construction of a reservoir may appreciably affect the natural yield by the introduction of a new factor, namely, evaporation from its water-surface. Allowances rendered necessary by the working of a reservoir, such as draught to supply and overflow, may also be sources of error.

Secondly, only certain of the conditions affecting Rainfall and Yield, such as size and shape of the drainage area, its topography, geology, condition of surface and natural storage capacity, are constant; others, such as time-distribution and intensity of rainfall, temperature, direction and intensity of wind and saturation, are continually changing. But an equation allowing for these factors is not feasible, and for practical purposes a simple straight-line relation is undoubtedly preferable.

The third source of discrepancy lies partly in the fact that the yield lags behind the rainfall; they are therefore not comparable in every respect over one and the same period. The rainfall of any year might be compared with the yield of the year ending later by the amount of the lag. But even if it is possible to determine its numerical value, the problem of correlation is not thereby solved, for a drainage area not only has a retarding, but also an equalising, effect upon its discharge. The flow of a stream consists essentially of a series of freshets following one another at intervals in accordance with the occurrence of the rainfall from which they are derived. The main mass of the flood-wave usually follows quickly on the rainfall, but weeks and months may pass before the whole of the flow due to that fall has drained off. With most streams in temperate countries the tail-end of a freshet is replenished by its successor long before the channel runs dry, so that the discharge

Fig. 1.

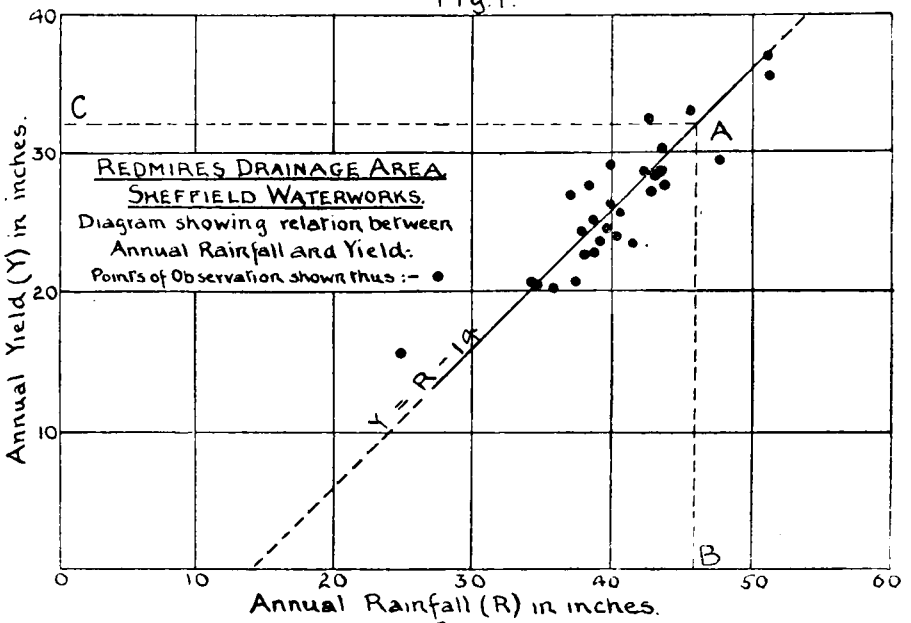
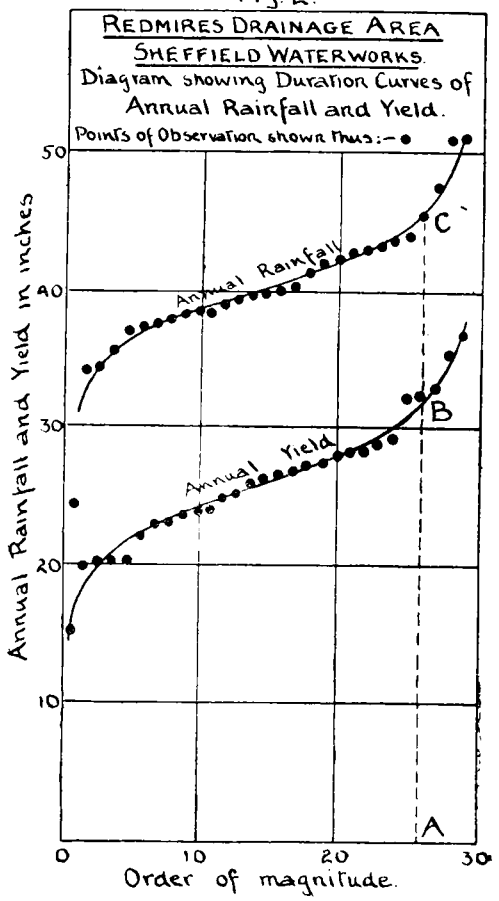
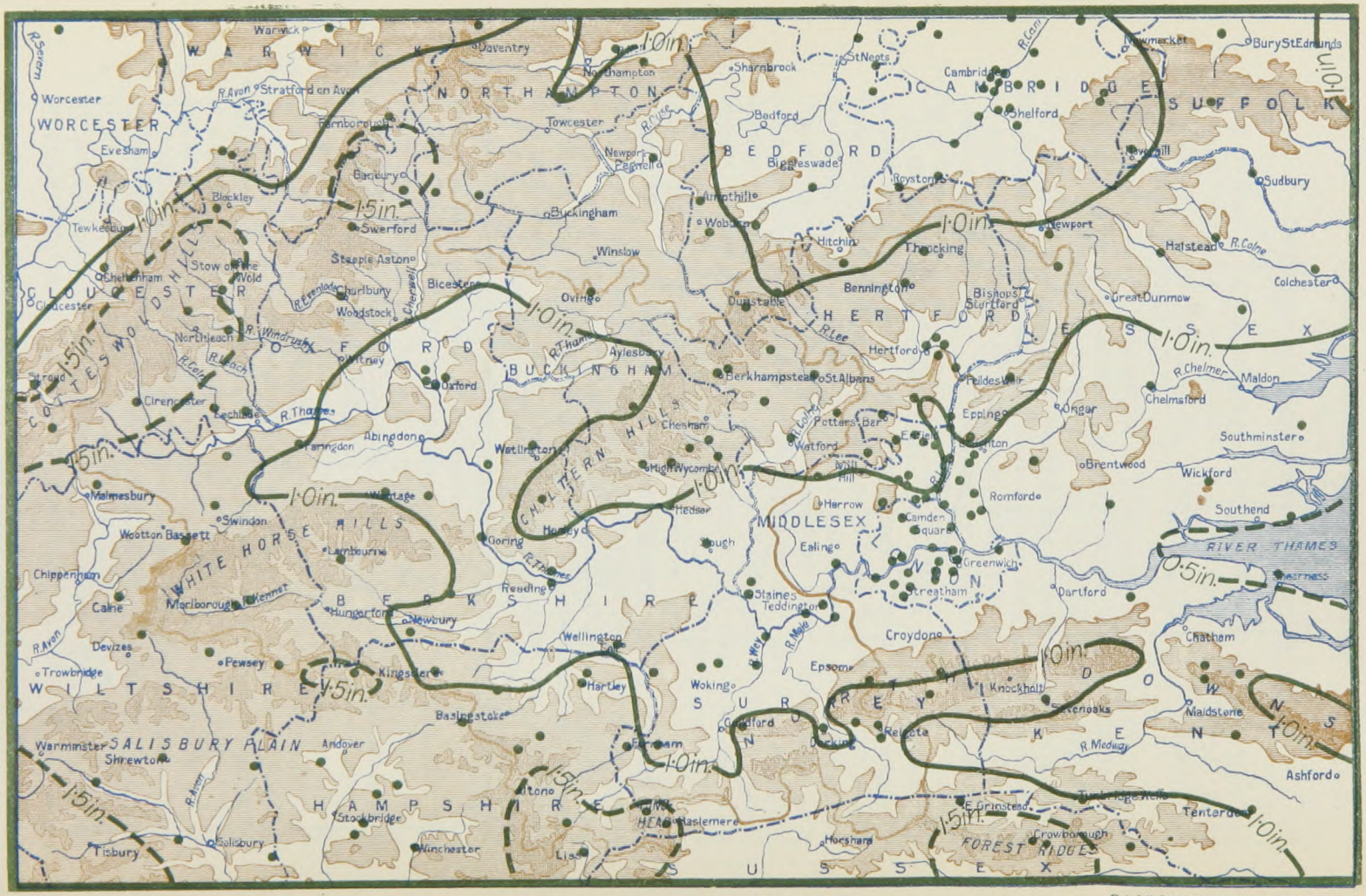


Fig. 2.



D Halrow-Thomson

THAMES VALLEY RAINFALL——SEPTEMBER, 1914.


ALTITUDE SCALE
Below 250 feet
250 to 500 feet
500 to 1000 feet
Above 1000 feet
SCALE OF MILES
0 5 10 15 20
WARWICK
WORCESTER
NORTHAMPTON
BEDFORD
CAMBRIDGE
SUFFOLK
GLOUCESTER
OXFORD
BUCKINGHAM
HERTFORD
ESSEX
MIDDLESEX
BERKSHIRE
WILTSHIRE
SURREY
KENT
HAMPSHIRE
SUSSEX
COTESWOLD HILLS
CHILTERN HILLS
WHITE HORSE HILLS
SALISBURY PLAIN
FOREST RIDGES
1·0in.
1·5in.
0·5in.
Warwick
Coventry
Northampton
Worcester
Stratford on Avon
Towcester
Evesham
Bedford
Sharnbrook
St Neots
Cambridge
Bury St Edmunds
Shelford
Sudbury
Biggleswade
Royston
Newmarket
Blockley
Tewkesbury
Swerford
Buckingham
Winslow
Wobburn
Hitchin
Thocking
Newport
Halstead
Colchester
Great Dunmow
Stow on the Wold
Cheltenham
Gloucester
Stepple Aston
Bicester
Churbury
Woodstock
Ovingo
Dunstable
Bennington
Bishops Stortford
Hertford
Aylesbury
Berkhampstead
St Albans
Peldes Weir
Chelmsford
Maldon
Epping
Ongar
Potters Bar
Watford
Enfield
Brentwood
Wickford
Southminster
Southend
Romford
Harrow
Camden Square
Ealing
Greenwich
Woolwich
Dartford
Westness
Chatham
Maidstone
Ashford
Tenterden
Tunbridge Wells
Crowborough
Horsham
Croydon
Epsom
Knockholt
Sevenoaks
Reigate
Guildford
Woking
Staines
Teddington
Hartley
Basingstoke
Andover
Whitchurch
Alton
Winchester
Stockbridge
Salisbury
Tisbury
Shrewton
Warminster
Devizes
Trowbridge
Pewsey
Kingsclere
Newbury
Hungerford
Marlborough
Calne
Chippenham
Malmesbury
Wootton Bassett
Swindon
Lambourne
Wantage
Abingdon
Wallingford
Goring
Henley
Reading
Oxford
Witney
Chipping Norton
Cirencester
Tetbury
Northleach
Windrush
Thame
Aylesbury
High Wycombe
Chesham
Hedsor
Slough
Hill
Harrow
Camden Square
Ealing
Staines
Teddington
Croydon
Epsom
Knockholt
Sevenoaks
Reigate
Guildford
Woking

at a given moment may be composed of water originating from a number of entirely independent rain-spells. Moreover, since rainfall varies very considerably from year to year, the surplus yield at the end of a wet year will be greater than at the end of a dry year. Other conditions being unchanged, therefore, the yield of a wet year following a dry year will bear a less than normal proportion to the rainfall, since it will include only a small surplus from that dry year; and, conversely, the yield of a dry year following a wet year will bear a greater than normal proportion to the rainfall, since it will include a large surplus from that wet year.

Some assistance may be gained by regarding the problem from another point of view. Rainfall is a physical phenomenon which varies from year to year, according to some ill-understood law; over a short period these fluctuations appear to be fortuitous, but a long period evinces the fact that those years, the fall in which is in the neighbourhood of the average, occur most frequently, whilst the greater the deviation from the average, both in excess and in defect, the more rare is their recurrence. The longer the periods available, the more marked and regular is this frequency relation. Similarly, the annual yield, since it is derived from the rainfall, varies accordingly to a frequency relation, the form of which, however, will differ from that of the rainfall, since the discharge is equalised by the drainage area and subject to certain losses. If, then, the annual rainfall and yield be taken separately, and the approximate frequency law which a long series of each would ultimately assume be capable of determination, the two phenomena may be correlated on the assumption that the rainfall of a given frequency produces a yield of the same frequency. By this means all considerations of time-lag and difference of time-distribution are eliminated, a simple comparison being made between two events, one of which is known to be derived from the other, and each of which occurs on an average at equal intervals of time. The annual records from 1879 to 1907 of the Redmires drainage area of the Sheffield Water Works are selected as an example. Each yield is plotted in Fig. 1, as a black dot against the rainfall of the corresponding year. The distribution of these dots is markedly irregular. Now, in order to apply the principle of equal frequency enunciated above, the two sets of observations are plotted in order of magnitude in Fig. 2. It is immaterial that the years in each set do not appear in the same order. The horizontal scale then measures the number of years out of the total (in this case 29) during which a rainfall or yield of given magnitude is equalled or exceeded, and smooth curves drawn among the points by freehand, as shown, represent very fairly the frequency relation, were an indefinitely long series of observations available. When more than, say, twenty years' record can be utilised, the points usually lie in a fairly regular manner. The points where any ordinate, such as ABC, cuts the

curves, represent the rainfall and yield occurring on an average with equal frequency. The rainfall AC and the yield AB may, therefore, be transferred to Fig. 1, and used as the co-ordinates of a point on the required straight line. A series of points thus transferred will be found to lie on a straight line, or very nearly so, among the points of observation, and from this a formula for the drainage area can be calculated.

METEOROLOGICAL NEWS AND NOTES.

We have just received from Mr. E. Gold an interesting account of the meteorological proceedings at the British Association meeting in Australia, which we hope to publish next month.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

ARE ENGLISH THUNDERSTORMS MORE DANGEROUS THAN INDIAN?

The above question has been asked in your Magazine for July. I, having travelled all over India, from Cashmere to Point de Galle, and from Karachi to Singapore, occupying a time of several years, embracing some five hot seasons in Meerut and other stations in the Punjab, must have experienced many heavy thunderstorms, particularly at the beginning and ending of the Burra Barsaat (Big Rains) and in all that time never knew or heard of a European or native being killed or struck by lightning, except one by the lightning having gone down through the roof of a bungalow, an iron wire suspending an oil lamp being the conductor. During the small rains (Choto Barsaat), and winter there are sand storms which are mostly accompanied by lightning, but it is mild sheet lightning, and seldom or ever with thunder; when this occurs black and heavy clouds come on and sometimes considerable heat, yet all seems too high in the air, hence no fatalities occur.

I have heard of one or two high buildings being struck, notably the Kootab Minaar, near Delhi (the highest tower in India), but up in the Mountains I have seen tall trees, poplars, pines, deodars, etc., ripped of their bark in strips, by lightning.

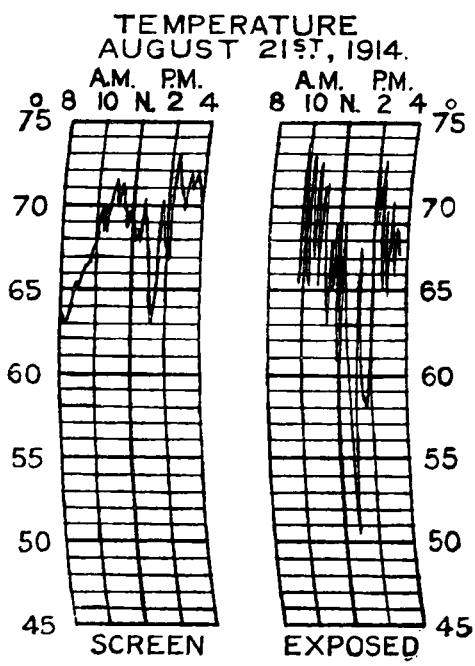
I therefore answer your correspondent's question as for the fact in the affirmative; and for the reason consider it due to the lightning occurring high in the air. I have never seen lightning so low near the earth in the East as I have in England. G.G.

1st September, 1914.

TEMPERATURE DURING PARTIAL SOLAR ECLIPSE.

THE publication in this month's Magazine of the temperature observations made during the recent Eclipse, by Mr. Nowell ffarington, in Lancashire, and by Mr. D. S. Salter, at Camden Square, has suggested to me that possibly your readers might be interested in seeing two thermograph records, reproduced herewith, obtained by me during the continuance of the phenomenon, one of the instruments being in a Stevenson screen, whilst the other was fully exposed in the open air upon a stand two and a half feet above the grass, with the coil projecting beyond the stand and pointing to the south with an absolutely clear exposure all round.

During the eclipse the sky was generally clear, but there were a few detached clouds which occasionally screened the sun, although they were, as a rule, so thin that they only served to enable one to dispense with the usual piece of coloured glass when looking at the sun, and they were generally very transient; just as the eclipse was ending the sky grew overcast and we had a brief thunder shower.



At Norden the maximum fall of temperature due to the eclipse was 3°·9, and at Camden Square it was 2°·2. At Warlingham it was in the screen 7°, and in the open 18°, whilst after the recovery which followed the occurrence of the greatest phase of the eclipse there was a second fall, amounting to nearly 3° in the screen, and to 8° in the open, due to the thunderstorm; and then a rise of 6° and 13°·5 respectively, to the maximum temperature of the day, as recorded in the screen.

The question may reasonably be asked, are these records correct? and in reply I may say that the accuracy of thermographs of this type employed, when properly handled, would probably surprise most meteorologists. In the screen, with the thermograph, I keep a mercurial thermometer by Casella, which I have had in use for more than thirty years and which is tested in ice every year; a maximium by Negretti, and a spirit minimum by Hicks, which are also verified annually; these thermometers are read every day for comparison with the thermograph record, and as regards the ordinary thermo-

meter and the minimum, the agreement is almost invariably well within half a degree. In the case of the maximum the trace reading will, on hot days, generally exceed the standard, sometimes by as much as 3°, but more frequently by 1° or 2°. On the day in question the dry bulb at 9.30 a.m. was 66°, which was exactly the reading of the trace, and on the following morning the maximum for the day of the eclipse read 73°, as against 73°·2 by the trace, and the minimum temperature by both thermometer and trace was 56°.

How, then, can we account for the large oscillation of temperature at Warlingham, as compared with that at the other places? The explanation is simple, and lies in the fact that the coil of the thermograph is far more sensitive to change of temperature than is the bulb of an ordinary mercurial or spirit thermometer, and responds to any change almost instantly, whereas it takes an appreciable time for the mass of mercury in a bulb half an inch in diameter, which is the usual size of thermometer bulbs, fully to do so. It commonly happens that the absolute maximum of the day is reached by very brief bursts of heat, which do not last long enough to allow the thermometer fully to respond to them, although they are sufficient for the thermograph, and thus arises the frequent difference between the two records; whilst, on the other hand, the minimum is generally more gradually reached, and the two instruments march closely together, as they do also in the morning when, as a rule, the temperature does not change too rapidly for the thermometer to keep pace with it. This sensitiveness of the thermograph and relative sluggishness of the thermometer accounts for the comparatively large fall in the thermograph record during the eclipse; and I have not the least doubt that in many cases in which thermometers, not specially constructed with a view to sensitiveness, have been used for measuring quick temperature changes (not necessarily for meteorological purposes) inaccurate results have been obtained owing to their sluggishness; indeed, considering how long it takes for a clinical thermometer with a thin cylindrical bulb in close contact with the body to record, one can see how long it would take when the medium is still air, and when so large a mass of mercury is enclosed in the spherical bulb of a meteorological thermometer.

An experiment I have several times made myself, and seen made by others, has been to mount a thermograph coil upon a piece of wood so that it could be immersed in water, an arm carrying an index point being attached to it so that its indication could easily be read. The coil and a thermometer were then immersed simultaneously in warm (or cold) water, when the arm would record the temperature long before the thermometer was able to overtake it.

I have said these thermographs are accurate when properly handled. The great secret of success in getting good records is delicacy of touch between the pen and the paper. Pressure of any kind is unnecessary and pernicious; the pen must touch the paper

but it cannot do so too lightly; and further the pen must have a fine point—you cannot expect to get a clear trace if you use a pen with a broad point.

All Richard's thermographs were, and probably still are, made with a large bulb of spirit; you must not expect so great sensitiveness from them as from the "Spring" form of instrument; and finally, whether it be a "Spring" or a "bulb," it must not be enclosed in the case in which the clock is placed, but project well beyond it. The first thing I did with the Spring instrument when first asked to test it, was to have the coil taken out of the clock-case and fixed outside it; in the instruments now made for the Meteorological Office, the case is only large enough to hold the clock, and the coil projects about three inches beyond it. R. H. CURTIS.

Late Superintendent of Instruments, Meteorological Office.

Warlingham, 30th September, 1914.

REVIEW.

Clare Island Survey; Climatology. By W. J. Lyons. Reprinted from Proceedings of the Royal Irish Academy, Dublin, 1914. Size $10\frac{1}{2} \times 7$. Pp. 22, and Plates.

Professor Lyons undertook the climatological part of a complete scientific study of Clare Island, which lies off the coast of Mayo, 3 miles south of Achill Island. He merely claims for his work a place as an appendix to the results of the biological studies which formed the main object of the survey.

He divides the subject into six heads :—1. Wind, based upon 17 years' observations at the Clare Island Lighthouse; 2. Barometric Pressure, derived from the records for 35 years at Blacksod, on the mainland, 20 miles from the Island; 3. Air Temperature, also derived from the Blacksod observations for 35 years, the imperfect record being extended by reference to the records at Ardrossan and Valencia; 4. Humidity, also derived from Blacksod and other stations from the 8 a.m. dry and wet bulb readings; 5. Rainfall, derived mainly from the records at Blacksod and Crossmolina for averages, and for local distribution on records kept on the Island itself between 1910-1912. These included those of a hyetograph which Professor Lyons points out on our authority to be the only record of the kind available for Ireland. It might perhaps have been as well to have indicated that "available" was used in the sense of available for publication in *British Rainfall*, as of course the hourly values of rainfall from self-recording gauges at Armagh and Valencia have long been recorded by the Meteorological Office. 6. The sixth and last heading is Sunshine, but the only record in the north-west of Ireland was that at Markree Castle, which are hardly representative.

RAINFALL TABLE FOR SEPTEMBER, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·00	1·00
Tenterden	*Kent*	51 4	*0 41	190	2·25	·98
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·58	1·77
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·60	1·54
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·98	·76
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·14	...
Shoeburyness	*Essex*	51 31	*0 48	13	1·70	·54
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·18	1·17
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·13	·77
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·11	3·05
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·69	2·90
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·39	1·29
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·40	1·05
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·35	·71
Boston	*Lincolnshire*	52 58	0 1	11	2·07	·93
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·84	·99
Macclesfield	*Cheshire*	53 15	2 7	501	2·92	3·24
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	3·09	3·62
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·55	3·08
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·11	1·30
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·05	1·34
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·00	2·16
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·28	5·12
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·61	3·09
Haverfordwest	*Pembroke*	51 48	4 58	90	3·91	2·43
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·89	2·74
Llandudno	*Carnarvon*	53 20	3 50	72	2·50	2·60
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·34	2·00
Marchmont House	*Berwick*	55 44	2 24	498	2·67	·95
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·30	2·62
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·99	1·60
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·15	5·14
Mull (Quinish)	,,	56 34	6 13	35	5·20	3·79
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·34	·81
Braemar	*Aberdeen*	57 0	3 24	1114	2·73	·84
Aberdeen (Cranford)	,,	57 8	2 7	120	2·69	1·19
Cawdor	*Nairn*	57 31	3 57	250	2·55	1·49
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·54	2·19
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·28	6·70
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·51	1·80
Wick	*Caithness*	58 26	3 6	77	2·57	2·32
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·79	4·12
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·19	1·59
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·16	2·29
Ennistymon House	*Clare*	52 57	9 18	37	4·22	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·78	1·68
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·93	2·09
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·06	1·36
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·02	2·16
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·42	3·63
Cong (The Glebe)	,,	53 33	9 16	112	4·05	2·92
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·65	2·57
Seaforde	*Down*	54 19	5 50	180	3·25	1·18
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·49	2·27
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·39	2·11

RAINFALL TABLE FOR SEPTEMBER, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION
—1·00	50	·18	12, 20	9	17·92	14·63	—3·29	82	25·11	Camden Square
—1·27	44	·29	12	6	18·32	17·39	— ·93	95	27·64	Tenterden
— ·81	69	·64	12	8	20·02	19·31	— ·71	96	30·48	Patching
—1·06	59	·43	12	9	21·18	21·81	+ ·63	103	31·87	Cadland
—1·22	38	·28	10	6	17·45	16·43	—1·02	94	24·58	Oxford
...	...	...	...	...	18·20	...	..	...	25·17	Croyland Abbey
—1·16	32	·18	13	11	13·17	11·38	—1·79	86	19·28	Shoeburyness
—1·01	54	·47	12	7	18·14	15·78	—2·36	87	25·40	Westley
—1·36	36	·25	12	11	16·33	13·70	—2·63	84	23·73	Geldeston
— ·06	98	1·17	9	15	24·90	30·71	+5·81	123	38·27	Polapit Tamar
+ ·21	108	1·12	9	9	22·54	27·35	+4·81	121	33·54	Rousdon
—1·10	54	·28	12, 15	7	21·12	19·54	—1·58	93	29·81	Stroud
—1·35	44	·37	12	9	22·71	21·43	—1·28	94	32·41	Wolstaston
—1·64	30	·20	12	8	20·51	14·16	—6·35	69	28·98	Coventry
—1·14	45	·20	12	8	16·67	13·19	—3·48	79	23·35	Boston
— ·85	54	·39	8	8	17·54	12·76	—4·78	73	24·46	Hodsock Priory
+ ·32	111	1·05	12	11	24·85	27·38	+2·53	110	34·73	Macclesfield
+ ·53	117	1·36	16	12	22·70	20·99	—1·71	92	32·70	Southport
—1·47	68	1·24	16	11	42·14	38·02	—4·12	90	61·49	Arncliffe
— ·81	62	·55	17	4	19·08	16·86	—2·22	88	26·87	Ribston Hall
— ·71	65	·36	17	9	18·57	15·48	—3·09	83	26·42	Hull
+ ·16	108	·65	16	11	19·65	18·10	—1·55	92	27·94	Newcastle
—6·16	45	·80	12, 13	15	88·04	84·09	—3·95	96	129·48	Seathwaite
— ·52	86	·95	13	12	28·63	34·10	+5·47	119	42·28	Cardiff
—1·48	62	·70	10	9	30·96	33·16	+2·20	107	46·81	Haverfordwest
—1·15	70	·64	12	12	30·92	33·22	+2·28	107	45·46	Gogerddan
+ ·10	104	1·09	16	10	20·55	19·62	— ·93	95	30·36	Llandudno
—1·34	60	·73	16	12	29·83	30·58	+ ·75	103	43·47	Cargen
—1·72	36	·28	16	10	23·89	17·20	—6·69	72	33·76	Marchmont
—1·68	61	·70	13	12	33·67	35·87	+2·20	107	49·77	Girvan
—1·39	53	·52	15	12	25·03	22·66	—2·37	91	35·97	Glasgow
—1·01	84	·79	23	18	46·21	49·26	+3·05	107	68·67	Inveraray
—1·41	73	·95	16	18	37·87	36·97	— ·90	98	56·57	Quinish
—1·53	35	·42	17	5	20·54	16·49	—4·05	80	28·64	Dundee
—1·89	31	·18	19	12	24·16	21·71	—2·45	90	34·93	Braemar
—1·50	44	·23	23	8	22·78	17·88	—4·90	79	32·73	Aberdeen
—1·06	58	·49	23	5	21·25	18·51	—2·74	87	29·33	Cawdor
—1·35	62	·40	14	18	30·26	26·07	—4·19	86	44·53	Fort Augustus
— ·58	92	1·05	14	16	56·79	66·40	+9·61	117	83·93	Bendamph
— ·71	72	·61	14	7	22·41	21·13	—1·28	94	31·90	Dunrobin Castle
— ·25	90	·71	14	21	20·68	19·42	—1·26	94	29·88	Wick
+ ·33	109	1·05	16	17	36·76	43·94	+7·18	119	54·81	Killarney
—1·60	50	·77	16	5	27·45	25·87	—1·58	94	39·57	Waterford
— ·87	72	·54	7	12	27·73	27·76	+ ·03	100	39·43	Castle Lough
...	...	...	...	...	32·47	...	...	...	46·52	Ennistymon
—1·10	60	1·04	16	7	24·41	22·70	—1·71	93	34·99	Courtown Ho.
— ·84	71	·90	16	12	25·70	25·86	+ ·16	101	35·92	Abbey Leix
— ·70	66	·75	16	9	19·89	15·82	—4·07	80	27·68	Dublin
— ·86	71	·45	8, 16	13	26·19	26·58	+ ·39	101	36·15	Mullingar
— ·79	82	·67	22	18	35·74	36·59	+ ·85	102	52·87	Enniscoe
—1·13	72	·53	22	13	33·88	36·31	+2·43	107	48·90	Cong
—1·08	70	·50	23	17	30·14	32·63	+2·49	108	42·71	Markree
—2·07	36	·23	12	10	27·63	22·81	—4·82	83	38·91	Seaforde
—1·22	65	·55	10	12	26·32	23·77	—2·55	90	37·56	Dundarave
—1·28	62	·42	12	14	28·05	27·40	— ·65	98	39·38	Omagh

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	·93	XI.	Lligwy	3·02
,,	Ramsgate	·52	,,	Douglas	2·00
,,	Hailsham	1·49	XII.	Stoneykirk, Ardwell House...	1·19
,,	Totland Bay, Aston House...	1·27	,,	Dalry, The Old Garroch.....	...
,,	Stockbridge, Ashley	1·04	,,	Beattock, Kinnelhead	1·96
,,	Grayshott	1·61	,,	Langholm, Drove Road	2·63
III.	Harrow Weald, Hill House...	1·02	XIII.	Meggat Water, Cramilt Lodge	2·18
,,	Caversham, Rectory Road ...	·86	,,	North Berwick Reservoir.....	·51
,,	Pitsford, Sedgebrook...	1·02	,,	Edinburgh, Royal Observaty.	·57
,,	Woburn, Milton Bryant.	1·09	XIV.	Maybole, Knockdon Farm ...	2·35
,,	Chatteris, The Priory...	1·01	XV.	Ballachulish House	5·98
IV.	Elsenham, Gaunts End	1·05	,,	Campbeltown, Witchburn ..	3·64
,,	Colchester, Hill Ho., Lexden	1·09	,,	Holy Loch, Ardnadam	4·51
,,	Ipswich, Rookwood, Copdock	1·14	,,	Islay, Eallabus	3·40
,,	Blakeney	·46	,,	Tiree, Cornaigmore	3·55
,,	Swaffham	·90	XVI.	Dollar Academy	1·42
V.	Bishops Cannings	1·41	,,	Balquhidder, Stronvar	2·70
,,	Wimborne, St. John's Hill...	1·99	,,	Glenlyon, Meggernie Castle..	2·40
,,	Ashburton, Druid House...	2·95	,,	Blair Atholl	1·13
,,	Cullompton	2·32	,,	Coupar Angus	·64
,,	Lynmouth, Rock House	3·02	,,	Montrose, Sunnyside Asylum.	·81
,,	Okehampton, Oaklands...	2·99	XVII.	Alford, Lynturk Manse	1·33
,,	Hartland Abbey	2·32	,,	Fyvie Castle	2·06
,,	Probus, Lamellyn	2·43	,,	Keith Station	2·49
,,	North Cadbury Rectory.	2·16	XVIII.	Rothiemurchus	1·31
VI.	Clifton, Pembroke Road....	1·63	,,	Loch Quoich, Loan	12·50
,,	Ross, The Graig	1·08	,,	Drumnadrochit	1·35
,,	Shifnal, Hatton Grange.	1·47	,,	Skye, Dunvegan	8·06
,,	Droitwich	·98	,,	Lochmaddy, Bayhead	4·59
,,	Blockley, Upton Wold	1·37	,,	Glencarron Lodge	8·03
VII.	Market Overton	·50	XIX.	Inversnin	2·44
,,	Market Rasen	·71	,,	Melvich	3·97
,,	Bawtry, Hesley Hall	·70	,,	Loch Stack, Ardchullin	9·17
,,	Derby, Midland Railway	·97	XX.	Skibbereen Rectory	3·86
,,	Buxton	4·14	,,	Dunmanway, The Rectory ..	4·23
VIII.	Nantwich, Dorfold Hall	2·06	,,	Glanmire, Lota Lodge	2·84
,,	Chatburn, Middlewood	3·89	,,	Mitchelstown Castle	3·52
,,	Cartmel, Flookburgh	...	,,	Darrynane Abbey	4·58
IX.	Langsett Moor, Up. Midhope	2·67	,,	Clonmel, Bruce Villa	3·28
,,	Scarborough, Scalby	1·74	,,	Newmarket-on-Fergus, Fenloe	4·39
,,	Ingleby Greenhow	1·96	XXI.	Laragh, Glendalough	2·49
,,	Mickleton	2·10	,,	Ballycumber, Moorock Lodge	1·42
X.	Bellingham, High Green Manor	1·22	,,	Balbriggan, Ardgillan	1·07
,,	Ilderton, Lilburn Cottage ...	1·14	XXII.	Woodlawn	2·43
,,	Keswick, The Bank	2·40	,,	Westport, St. Helens	2·64
XI.	Llanfrechfa Grange	2·09	,,	Dugort, Slievemore Hotel ..	3·73
,,	Treherbert, Tyn-y-waun	4·32	,,	Mohill Rectory	1·51
,,	Carmarthen, The Friary	2·27	XXIII.	Enniskillen, Portora	1·94
,,	Castle Malgwyn [Llechryd]...	..	,,	Dartrey [Cootehill]	1·73
,,	Crickhowell, Tal-y-maes	3·00	,,	Warrenpoint, Manor House ..	1·28
,,	New Radnor, Ednol	2·05	,,	Banbridge, Milltown	1·21
,,	Birmingham WW., Tyrmynydd	2·67	,,	Belfast, Cave Hill Road	1·71
,,	Lake Vyrnwy	...	,,	Glenarm Castle	...
,,	Llangyhanfal, Plâs Draw	2·75	,,	Londonderry, Creggan Res...	2·86
,,	Dolgelly, Bryntirion	3·47	,,	Dunfanaghy, Horn Head ...	2·26
,,	Bettws-y-Coed, Tyn-y-bryn...	3·26	,,	Killybegs	4·15

THE WEATHER OF SEPTEMBER.

THE anticyclonic conditions which prevailed in the latter days of August continued into September, and light winds with dry weather and an abundance of sunshine were experienced over the United Kingdom generally. Temperature remained well above the average, and 81° or 82° was reached at many stations in the Midlands and the south and east of England on the 3rd. A depression which advanced from the Bay of Biscay, in a north-easterly direction, caused thunderstorms at many places in the south-west of England and the south of Ireland, on the 8th and 9th. The heaviest falls, all of which occurred on the 9th, were 2·36 in. at Salcombe Regis, 2·15 in. at Sidmouth, and 1·81 in. at Exeter. At Broadford (Co. Clare), Lieut.-Col. Bentley reports that the thunder began at 1 p.m. in the north-east, when the sky in that direction was as black as ink. Rain began to fall at 3.40 p.m., and stopped at 5.15 p.m., when 1·06 in. had fallen. Four miles to the south there was no rain at all. On the 11th a large depression, accompanied by a secondary, which moved directly across the country, to the coast of Norway, brought the wind into the south-west and west generally. On several exposed parts of the coast gales were reported. In the week following rather large and deep depressions, travelling from west to east, caused rough weather. Severe gales occurred over a wide area on the 14th. At Southport gusts blew at the rate of 90 miles per hour. At Castle Forbes many trees were blown down and the fruit crops suffered much injury. More than 1 inch of rain fell at many stations in the west of England and the south of Ireland, on the 16th, the heaviest falls we have noted being 2·21 in. at St. Annes-on-the-Sea, and 1·66 in. at Sedbergh. Thunderstorms, or thunder only, occurred at some stations in Scotland and the north of England on the 19th. With the exception of a small area in the north of Scotland, where heavy rain fell on the 30th, the last 10 days were practically rainless. At many stations in southern Ireland the dry period lasted from the 17th, and in the midland and south-eastern counties of England, from the 19th. Though generally sunny, the temperature was somewhat low, and frosts occurred in the Midlands and in the east of the Kingdom generally, on the 22nd, 23rd, and 30th. Heavy rain fell in the north of Scotland on the 30th, 2·81 in. being measured at Loch Stack, and 1·12 in. at Melvich.

In London the weather was fine and sunny, with normal temperature and but little rain. None fell in the first 8 or the last 10 days. At Camden Square. the mean temperature was 57°·9 or 0°·2 above the average. The total evaporation was 1·68 in., and the duration of rainfall was 16·3 hours. The duration of sunshine, 176·6 hours, was the greatest for the month in the past 11 years, excepting the brilliant September of 1911. Other sunshine records were : Copdock, 195·9 hours, Totland Bay, 205·5 hours, Sidmouth, 226·1 hours Ashbourne, 178·1 hours, and Loch Stack, 85·5 hours.

The general rainfall over the country, expressed as a percentage of the average, was as follows : England and Wales, 66 ; Scotland, 66 ; Ireland, 69 ; British Isles, 67, the rainfall being thus almost exactly two-thirds of the average for September.

Climatological Table for the British Empire, April, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain Depth.	Total Rain Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	76·2	21	34·4	26	62·6	41·6	42·3	72	119·3	27·6	·81	9	4·0
Malta	74·5	10	51·2	2	62·4	52·2	...	83	131·0	...	·02	1	1·3
Lagos	92·0	9*	72·0	10	89·8	76·9	74·9	73	154·0	68·0	4·54	9	7·2
Cape Town	86·5	30	43·6	12	70·8	54·3	53·2	72	...	...	1·62	12	5·8
Natal, Durban ...	78·0	1, 8†	53·0	25	72·7	65·0	65·0	80	...	...	6·71	11	5·0
Johannesburg	77·5	10	36·8	25	71·7	52·1	50·8	76	...	33·5	·51	7	3·5
Mauritius	86·3	3	62·9	6	82·7	69·9	69·1	80	...	57·6	2·84	17	5·5
Bloemfontein	83·0	21	31·0	25	73·4	49·0	46·6	65	...	...	1·44	4	2·7
Calcutta...	97·1	2	64·3	29	92·9	73·4	70·1	69	...	63·0	3·22	8	4·4
Bombay...	91·3	30	73·3	10	88·0	76·3	72·9	75	133·6	65·4	·07	1	1·5
Madras	95·8	1	71·6	2	90·8	76·8	75·1	79	163·7	70·5	2·05	4	2·8
Colombo, Ceylon ...	92·1	25	71·4	12	90·4	74·9	77·6	78	...	67·0	3·81	15	4·8
Hongkong	87·2	25	55·9	5	76·3	68·0	66·4	83	...	...	4·47	15	8·5
Sydney	84·1	10	53·1	25	75·6	60·8	53·3	63	133·0	41·1	1·53	4	3·8
Melbourne	84·1	9	41·5	15	68·4	51·5	47·6	62	127·4	33·4	1·72	15	5·8
Adelaide	86·9	8	48·9	25	72·3	56·2	51·3	63	141·6	40·2	1·77	14	6·1
Perth	89·0	11	39·3	20	71·0	52·8	51·5	68	144·9	30·9	·75	14	4·4
Coolgardie	91·0	12	36·0	20	76·9	52·0	46·3	48	147·0	32·0	·23	3	2·6
Hobart, Tasmania ..	79·3	9	37·3	11	61·6	47·4	44·5	63	125·4	32·0	3·05	17	7·1
Wellington ...	71·0	5	40·6	24	62·9	52·8	50·0	76	132·6	29·0	2·56	21	6·4
Auckland	72·0	16	46·5	18	66·9	54·5	54·6	81	138·0	42·0	4·21	20	6·3
Jamaica, Kingston ..	90·3	26	68·6	1	87·3	71·4	68·0	70	...	...	·95	6	...
Grenada	89·0	24	70·0	25	84·3	74·1	...	73	136·0	...	2·59	13	3·5
Toronto	67·0	18	21·5	9	48·9	34·1	31·0	72	78·2	18·8	1·92	12	6·1
Fredericton	70·0	19	—5·0	3	46·0	23·1	...	71	...	...	4·09	10	5·6
St. John, N.B. ...	59·8	27	16·0	3, 4	41·7	28·5	27·0	72	...	...	5·32	10	5·5
Edmonton, Alberta ...	72·8	30	8·2	2	54·3	29·1	...	50	127·9	5·5	·31	2	5·1
Victoria, B.C.	64·4	9	35·2	1	57·8	43·2	43·0	76	...	...	1·04	12	5·8

* 13 and 14. † 9 and 11.

Johannesburg.—Bright sunshine 268·6 hours.

Mauritius.—Mean temp. of air 0°·4, dew point 0°·7 above, and R 1·75 in. below, averages. Mean hourly velocity of wind 8·3 miles, or 2·2 below average.

HONGKONG.—Mean temp. of air 71°·5. Mean hourly velocity of wind 12·8 miles. Bright sunshine 114·4 hours.

Melbourne.—Mean temp. of air 0°·4 above, and R ·59 in. below, averages.

Adelaide.—Mean temp. of air 0°·4 above, and R ·08 in. below, averages.

Coolgardie.—Temp. of air 1°·0 below, and R about ·50 in. below, averages.

Hobart.—Mean temp. of air 0°·6 below, and R 1·24 in. above, averages.

Wellington.—Mean temp. of air 1°·0 above, and R 1·46 in. below, averages. Bright sunshine 150·3 hours.

Auckland.—Cloudy and showery, rainfall more than 1 in. above average and temp. slightly below.

ALBERTA, EDMONTON.—A sunny, rather warm and very dry month. Rainfall half the average.

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METEOROLOGY AT THE BRITISH ASSOCIATION.

By E. Gold, M.A.

For the fifth time in its history the British Association for the Advancement of Science met in one of the British Dominions beyond the Sea, the gatherings being held on this occasion in the various State capitals of the Commonwealth of Australia, during the month of August, 1914.

The principal meteorological event was a discussion on Antarctic Meteorology, opened by Dr. G. C. Simpson, of the Meteorological Office, Simla, who accompanied Scott's last Antarctic Expedition. Dr. Simpson gave a brief resumé of the prevailing views upon the general circulation in the polar half of the Southern Hemisphere, as given principally by Dr. W. J. Lockyer, in his "Southern Hemisphere Surface Air Circulation," and Prof. Meinardus, in his discussion of the results of the 'Gauss' Expedition. Lockyer's scheme shows a series of cyclones revolving round an Antarctic Anticyclone, and having their centres about 60° S. Meinardus' scheme is similar, but he raises objections to the existence of an Antarctic Anticyclone, chiefly on the ground that under anticyclonic conditions evaporation exceeds precipitation. Dr. Simpson showed diagrams based on the "Gauss'" observations, in which large variations of pressure were accompanied by no change in the direction of the wind, although it was blowing with gale force on many occasions. Such results are not consistent with a series of cyclones travelling from west to east, and, taken in conjunction with other evidence, indicate the inadequacy of the existing theories of the general circulation of the atmosphere in the Southern Hemisphere. He showed also, from the results of balloon ascents, that the vertical temperature gradient in calm weather was such that the lower air if it had descended from above would, if forced to rise again, reach the condensation point at a much lower level, and his opinion was that such forcible rising did take place in blizzards. There blizzards arise through the large difference between the temperature of the air over the Ross Sea, and of that over the Barrier. The differences amount to as much as 15° C., and owing to them a gradient of pressure is established which brings about an east wind, and at

the western side, owing to the great mountian barrier, a south-east wind. He deduces from these considerations that anti-cyclonic conditions are consistent with an excess of precipitation.

An examination of monthly means of pressure at Cape Evans and in Australia revealed the existence of a large negative corre lation, which afforded an additional reason for the establishment of a permanent meteorological station on the Antarctic Continent.

Mr. Hunt congratulated Dr. Simpson on the lucid exposition which he had given of Antarctic Meteorology. He himself thought that the persistent east wind at the Gauss quarters was not conclusive evidence that it was not associated with a cyclone, because the wind on the south side of a cyclone would be from the east.

Captain J. K. Davis spoke of the importance of taking into account the influence of floating ice in the Antarctic Seas. Great variations in this were found to occur and they could not but be associated with corresponding meteorological variations.

Mr. Griffith Taylor laid stress upon the contrast between the North and South Polar regions, and he thought that the controlling factor in Antarctic meteorology was the great Antarctic plateau.

Mr. Ferrar said that his observations on the " Discovery Expedition " bore out Dr. Simpson's conclusion regarding the temperature " escarpment " between the Barrier and the Ross Sea. He also observed that there was less snow present at the place of observation in February, 1904, than there was two years earlier, and, although this seemed to point to an excess of evaporation, he agreed that it could not be taken as evidence of general excess of evaporation over precipitation, which, if it existed, would have rendered South Victoria Land a bare land surface.

Mr. Gold referred to the changes of pressure without change of wind at the Gauss' quarters, and pointed out that such differences of temperature as were found between land and sea would result in a straightening and closing up of the isobars of a cyclone along the coast. An effect of this kind, combined with a motion of the cyclone in a south-easterly direction, might furnish the clue to the difficulty. He congratulated Dr. Simpson on having taken scientific account of the effect of the mountain ranges in controlling the direction of the air motion, thus, for the first time, substituting for the loose expression " physiographic influence," a definite reasoned argument.

An important communication was made by Prof. H. H. Turner in a paper entitled " Discontinuities in Meteorological Phenomena." He found that roughly every seven years the periodicity of various series of temperatures and rainfall changed. The periods were not exactly seven years, but themselves varied from 5·4 to 7·3 years; the maximum of 7·3 years was reached about every 41 years, after which the period diminished again. He found, on examination, that the movements of the earth's axis fit in well with this variation

of period, and incidentally he had discovered that a period of 41 years fitted Brückner's results better than the period of 35 years previously assigned. The minimum periods of about five years occurred about 1736, 1774, 1818, 1857, 1900, and these might be regarded as critical years. The complete series of periods is—

Adopted Dates of Discontinuity.

1730·6	1800·4	1882·7
1736·0	1813·0	1889·4
1741·6	*1818·3*	1895·2
1748·2	1823·9	*1900·6*
1755·5	1830·4	1906·2
1762·7	1837·8	1912·7
1769·0	1845·0	1920·1
1774·5	1851·4	
1779·8	*1856·7*	
1786·0	1862·1	
1792·9	1868·2	
	1875·3	

During the intervals between consecutive dates in the table the periodicity remains constant, but different from that in the next interval.

Dr. Simpson said that he had been much interested in the paper, but it was too complex for him to venture to offer criticism until he had time to look into the questions which it raised.

Mr. Gold trusted that Prof. Turner's results would find application to the problem confronting Australian meteorologists. He would like to know what were the magnitudes of the variations with which Prof. Turner had been dealing, because their usefulness depended on whether the amplitudes, in the case of rainfall, were fractions of an inch or comparable with the differences between a good year and a bad year.

In reply Prof. Turner said that the paper was still in the making, but the variations were roughly about 10 per cent. to 20 per cent. of the totals.

Mr. H. A. Hunt read a paper on Australian Rainfall before the Geographical Section, which he illustrated by a relief model of Australia, in which the vertical heights represented the amount of rainfall. The model displayed the distribution of rainfall even more effectively than a coloured chart.

Sir Oliver Lodge read a paper on "The Artificial Electrification of the Atmosphere," before the Engineering Section, and suggested that rain might be produced by this means. Dr. Simpson expressed his disagreement with the view that considerable condensation could be brought about in such a manner.

Among other papers of interest to meteorologists were a discussion on the "Physiography of Arid Lands," opened by Sir T. Holland; "Forest Climate and Rainfall," by Mr. Mackay; "Climate in the Pleistocene Age," by Prof. Gunnar Andersson; and "Climate from the Physiological Point of View," by Prof. W. A. Osborne.

THE PRACTICAL UTILITY OF A WORLD BUREAU OF METEOROLOGY.

By W. M. HAYS and H. H. CLAYTON.

OUR suggestions attempt to cover two objects, the first being to increase materially the value of the crop estimates of each country, and also of the Institute's world area estimates by taking account of the influences of meteorological happenings as soon after their occurrences as possible. The second is to unify and greatly improve the meteorological service of each country and of the entire world.

The first suggestion provides for the use of weather reports as bases for estimates of the effect of weather changes on crops. This is intended to improve upon the present plan of allowing private agencies to take immediate estimates of changes in crop prospects based on weather changes, while the public agencies ponderously wait until the changes are fully wrought out in the appearance of the crop.

The second suggestion has taken the form of a project for a World Meteorological Bureau, beside the Statistical Bureau in the International Institute of Agriculture.

The two propositions are closely related and interdependent. For the making of crop estimates as dependent on meteorological occurences it is essential to collect information of meteorological conditions. The study of these by trained experts in the manner suggested will permit of constantly increasing efficiency in crop estimates by establishing more exact relations between meteorological occurences and the crop growth, besides advancing the science of meteorology, in other ways.

Furthermore, with the assembled information properly treated, it will be possible to forecast coming meteorological changes, and these forecasts will permit the provisional estimate of crop condition in advance of occurrence, such estimates may, in time, prove of great value. They are already made now by private interests but in a crude way.

Since reports of meteorological conditions are gathered daily by wire, they serve as an immediate basis for predicting changes in crop yields from meteorological changes which have already occurred but not yet manifested themselves in a changed condition of crop.

Estimates of crop condition, based on reports made by growers and by bureau agencies are expensive, can be made only periodically, and are mainly records of effects of climatic changes some time past, their effect being already wrought out in the changed conditions of the crops.

Periodical estimates, based on observed conditions, giving acreage and excellence of the crop, are necessarily made at wide intervals.

A census of acreage, or at least a careful estimate, is a first necessity in estimating the crop products, in the terms of bushels or tons. When the crop has its growth well begun, an estimate of the excellence of the growth is also necessary. This can be made in percentage for each county, state, and nation, and for the world area. Under this plan the Bureau of Statistics of the United States Department of Agriculture can correct its plan of attempting monthly to give belated estimates of conditions, by making these "basal estimates" at wider intervals, and by using the daily telegrams of its weather reporting agencies as bases for "immediate estimates" wherever the exigencies of the occasion warrant raising or lowering. the single numerical figure representing the "basal estimates" of crop conditions. The Bureau of Statistics of the Argentine Ministry of Agriculture with its less frequent "basal estimates" will likewise be able simply to add "immediate estimates" based on the daily reports of the widely distributed agencies of its Weather Bureau.

The weather is the one great varying factor in crop production. By using the local records of temperature and rainfall and of destructive storms, prospects of crops can be foretold, often before the crops themselves indicate results of the climatic changes.

Even periodical invasions and movements of locusts and other migratory insects may be somewhat estimated from the effect of weather conditions on the insects and on their enemies.

International telegrams of weather conditions are already being collected by the national bureaus for use in foretelling and forecasting. The Indian Meteorological Service has been making seasonal forecasts of the weather for several years, based on information received from Australia, the Indian Ocean, Africa, Siberia, and South America, in correlation with the information obtained in India.

Similar season forecasts are in contemplation in Australia by the Commonwealth Bureau of Meteorology.

In the United States the Weather Bureau is now making forecasts for a week, based on daily telegrams received from Asia, Europe, the Azores, and some wireless reports from vessels at sea.

In Argentina the *Oficina Meteorologica* is collecting weather data daily by telegraph from Chili, Argentina, and Brazil, and contemplates extending the service to Bolivia and Peru.

All these reports could no doubt be concentrated at a Central Office with little expense by the courtesy of exchanging information and then be at the service of the International Institute of Agriculture, and of all the Weather Bureaus of the world.

These reports and all similar information which could be assembled quickly at a central bureau of meteorology could be charted and summarised at the Central Office; and such facts telegraphed to each country as would be of immediate service to that particular

country. In fact, at a comparatively small cost, it would be possible to telegraph to each country an outline map of world conditions. Both England and Germany publish international charts once a week or once in ten days, and the urgent need of an International Bureau or Clearing House of meteorological information, especially of current conditions, has been expressed by the leading meteorologists of England, Germany, and France.

Dr W. N. Shaw, Chief of the English Weather Service, when writing of the question of solar meteorological work says :—

" One plan of dealing with the results of solar research from the special point of view of weather would be to place (by publication or otherwise) all the solar data at the disposal of each of the contributing countries, and let them do what they think best about correlating them with weather data. This would mean independent appeals for meteorological data from all over the world, independent staff working at the same general problem, and incoordinated attacks upon the general problem. Whereas if the attack on the general problem is made the business of a centralised institution which can take up the line that seems to promise the best results, irrespective, in the first instance, of the special relation to this or that particular country, it is probable that success for each country will be accelerated.

Consequently, as it seems to me, a central bureau for dealing with the correlation of the weather data for the earth in general is almost a necessary correlative of a complete scheme of solar observations in which governments unite. I do not know that any single office not specially charged with this duty would like to take it on on its own account. We have all of us local claims upon the resources that keep us within a more limited horizon than the weather changes of the world at large, though perhaps each one of us would admit that if we had the pluck to embark upon a twenty year's enterprise of this kind we might do better in the end than simply ploughing our own furrow over and over again." *

These expressions of Dr. Shaw apply in the same force with regard to the relation of agricultural conditions to meteorological happenings as they do to the solar conditions. In " Nature " of February 26th, 1914, Dr. Shaw expresses the great desirability of " a daily weather map of the main features of the distribution of pressure and temperature over the globe."

Dr. Hellmann, Director of the Royal Prussian Meteorological Institute, has said that " if our knowledge of meteorology is to advance, daily or short periodical maps of the world would have to be made."

* *Report upon Observations made during an Official Visit to Europe, Asia and America. By H. A. Hunt, Commonwealth Meteorologist of Australia.*

Correspondence.

To the Editor of Symons's Meteorological Magazine.

VISIBILITY.

These notes constitute a summary of my experiences :—

1. Sunshine, especially in fine warm weather, is often fatal to effective observation.

2. Sunshine over a large body of water, such as the Severn Sea, is even more obstructive. Vapour is raised by the solar heat, and this vapour is likely to be partially condensed, by the passage of relatively cold currents from above, into thin whitish mist or haze. Moreover, the glare of sunshine on the whitish veil is distressing.

3. Anti-cyclones are distinctly bad—generally quite "hopeless." I think, however, that a fair degree of clearness may sometimes be enjoyed a little inside or outside of the edge of one of these formations, when a depression is advancing, the isobars lying more "amicably close," and the wind inclined to strengthen.

4. Mr. Marriott contends that vapour has little or nothing to do with the question of visibility. My experience seems to prove that the clearest horizons are found in cloudy, more or less showerful, but not necessarily dull, weather. Mr. Marriott refers to the difference between the dry and the wet bulb readings; but rain sometimes falls through a fairly dry atmosphere; and such weather may be found conducive to visibility, other matters being favourable.

5. The best winds, in respect of clear horizons, are generally those between west and north. The south-west is not always bad, but often *imports* vapour from a distance.

6. The worst winds are usually those between north-north-east and east-south-east. I am inclined to think that the south-east wind is variable.

7. The greatest success of my life, in respect of the observation of distances, was obtained some years ago in rather unsettled weather, and (I think) as late in the season as the first week of October. I was on the Wrekin, in Shropshire. I noticed, in a north by westerly direction, a bold and very remote group of hills, undoubtedly the mountains of Westmorland, distant about 125 miles. I think rain fell at Wellington a little before or a little after my discovery; and the Westmorland mountains themselves did not seem to be perfectly clear. It is plain, I think, that *humidity* was a factor in my success. I have no reason to suppose that the wind was noticeably high on that day.

Another instance I may mention of the coincidence of "humidity" (precipitation) with a unusual degree of atmospheric clearness. On the 29th of December, 1912, a hail-storm of great severity came on

near Ilfracombe, and land and sea-scapes were blotted out in gloom so profound that only the nearer features could be discerned. This condition lasted but a brief time; before I could reach the town, the local elevations, the Channel and the coast and mountains of South Wales were clearly revealed, while the great dome of Mynydd Presceli (the highest land in Pembrokeshire), heaved boldly against the north-westerly sky, at the distance of sixty miles. I think the wind was northerly or north-westerly.

E. G. ALDRIDGE, F.R.Met.Soc.

Barnstaple, 8th September, 1914.

WET AND DRY PERIODS.

I SHOULD like to call attention to two rather remarkable periods of, respectively, wet and dry weather this year here, which are obscured by the returns being made in monthly terms :—

February 22nd to April 6th	59 days	8·40 in.
July 9th to October 12th	82 days	1·75 in.

Neither I nor a neighbour, who is a large farmer and the same age as myself (81), can remember to have seen the country so dry in mid-October.

ALFRED O. WALKER.

Ulcombe Place, Nr. Maidstone, November 1st, 1914.

ABSOLUTE DROUGHT.

WE have just suffered from an absolute drought of eighteen days, August 26th to September 11th, and a partial drought of thirty-four days, August 8th to September 11th, when only ·19 of an inch fell; coming, as it did, at the end of summer, our rainwater tanks soon emptied, and the pond, the source of the drinking water supply, got very low indeed, reducing the depth of the well, which it feeds, from $2\frac{3}{4}$ feet to 5 inches, so that the pump was powerless. And yet this has not been by any means a very hot summer, though the nights have been unusually warm; we had a minimum of 62° on the night of the 7th-8th September, and 61° on the 9th-10th; altogether fourteen minimum readings of 60° or over, which must be unusual, from the 1st July to the 10th September. Whereas we only had three maxima of 80°, all in July.

I may mention that I know of a publican in a village near here, who has to send for water, all the year round, to the nearest town, two miles away. He makes a cask last a week.

HUBERT SATCHELL.

Shady Camp Vicarage, Bartlow, S. Cambs.

THERMOMETER VARIATIONS,

A REMARKABLE case of the wet bulb thermometer reading higher than the dry bulb occurred here at the end of September. I should like to bring it to the notice of your readers in order to learn whether anyone else has experienced a similar fault. The reading occurred on September 30th, at 7 a.m., in a calm atmosphere with some ground fog in places. The air was saturated at the time as indicated by the hair hygrograph. The readings were, dry bulb, 28°·7, wet, 31°·3, and as I was taking the morning observations myself and at once noticed the peculiarity I feel confident that it was not an error in reading. The record from the thermograph showed that the temperature had been below freezing since about 1 a.m., so that plenty of time had elapsed for the water to freeze on the bulb. However to make sure that it was not a case of the sudden freezing of supercooled water, I waited by the screen for fifteen minutes and fanned the instrument at intervals, but without producing any reduction of the reading.

The only explanation which seems possible is that for some reason the mercury column had broken, leaving the upper portion standing at 31°·3. A recent attempt to get such an effect by slowly reducing the temperature of the bulb from 32° to 31° by artificial means has proved fruitless, and on one occasion in October also the reading went below 31° in a normal manner, so that it seems as though the fault is not likely to be repeated.

The thermometer has a correction of —0°·2. Thus the corrected temperature at which it stuck was very close to 31°.

J. S. DINES.

Meteorological Office, South Farnborough, Hants.

TEMPERATURE DURING ECLIPSE.

I NOTICE in your last issue a note by Mr. R. H. Curtis with reference to "Temperature during partial Solar Eclipse." The following readings were taken by my assistant and checked by me.

Dry bulb reading in Stevenson's Screen : Highest, 72° ; Lowest, 65° ; Maximum fall, 7°.

Readings taken from delicate chemical thermometer, hung 60 ft. away from any buildings, 3 ft. from ground in direct sunlight.

11.18 a.m.	11.25	11.40	11.55	0.18 p.m.	0.45	Total fall
81°	72°	70°	69°	68°	69°	13°

The readings were taken to the nearest degree.

S. ALLINSON WOODHEAD, M.Sc.

Agricultural & Horticultural College, Uckfield, Sussex, October 19th, 1914.

SEASONAL LIMITS.

I HAVE for some time past been led very gradually to the conclusion that the Seasonal limits adopted for meteorological purposes are imperfect and need drastic revision. Under the present system the Spring is (as is well-known), represented by the months March, April and May; the Summer by June, July, and August; the Autumn by September, October, and November; and the Winter by December, January, and February. The common practice of grouping the weather into monthly periods seems to have lured us into ways which are, in many respects, indefensible.

I would submit, in the first place, that in this country, at all events, the various Seasons are not of equal length. Typical Summer weather and typical Winter weather (when we get it), usually lasts for more than three months at a stretch. Typical Spring and Autumn weather is, on the other hand, of far shorter duration.

In order to effect some more rational arrangement it is, I think, necessary to abandon the monthly grouping altogether and to substitute for it periods bounded by weeks, assigning, moreover, a longer period to the Summer and Winter than to the Spring and Autumn. The desirability of the change may be illustrated by a few recent examples :—

(*a.*) The extremely wet Winter of 1911-12 lasted until the middle of March. Under the existing system the heavy rains which fell during the first half of that month were credited, not to the Winter, but to the following Spring, which was otherwise a dry Season.

(*b.*) The magnificent Summer weather of 1911 continued until the middle of September, but owing to our defective method of classification the shade temperatures of 90° and upwards which were recorded in many parts of England in the earlier half of that month were credited, erroneously, as I submit, to the succeeding Autumn.

(*c.*) Going still further back we may instance the severe frost which occurred in the first week of March in 1909. The temperatures then recorded were lower than any observed in December, January, or February, but a strict adherence to the ordinary monthly and seasonal classification led to an assignment of the cold weather to the Spring season, not to the Winter, to which it properly belonged.

By a re-arrangement of the seasonal limits such cases of overlapping would, in nearly every instance, be avoided. In order to effect this I would suggest that the 52 weeks of the year be divided into two periods of 17 weeks each, representing the Summer and Winter, and two periods of 9 weeks each, representing the Spring and Autumn. In this way the Spring would comprise the 11th to 19th weeks of the year, running from about the middle of March to

the middle of May; the Summer the 20th to 36th weeks, running from the middle of May to the middle of September; the Autumn the 37th to 45th weeks, running from the middle of September to the middle of November; and the Winter the 46th week of one year to the 10th week of the following year, running from the middle of November to the middle of March. The Summer and Winter Seasons would, in this way, be lengthened at each end by a fortnight; while the Spring and Autumn Seasons would be correspondingly reduced. There would, at the same time, be no occasion to abandon entirely the conventional monthly classification, which has received international sanction, and is undoubtedly in some ways convenient.

For the purpose of comparison with the average the employment of Seasonal periods of unequal length would necessitate the use of percentages in place of differences, a method which has, I think, for some time past, commended itself to the notice of careful workers. The total rainfall, for example, in the Spring and Autumn Seasons, would usually be smaller than in the Summer and Winter, so that to quote the actual amount or the difference from the average in inches and parts of inches would give misleading results. By the employment of percentages the difficulty would be easily overcome.

The new classification I suggest may possibly seem too revolutionary to admit of general adoption, and the views of practical meteorological workers on this point is therefore invited. You may feel disposed to spare some space for a discussion of the subject.

FREDK. J. BRODIE.

12, Patten Road, Wandsworth Common, 23rd Oct., 1914.

LONG PARTIAL DROUGHT.

THE following particulars of the long partial drought may be of interest :—

Sept. 21	Oct. 1	Oct. 4	Oct. 8	Oct. 21	Oct. 22 ...	35 days
·01 in.	·07 in.	·01 in.	·02 in.	·02 in.	·06 in. ...	·19 in.

October 25th gave ·50 in. and October 26th, ·13 in.

W. F. VINT.

Cedars-End, Sunderland, October 27th, 1914.

RAINFALL TABLE FOR OCTOBER, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1914.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·72	1·25
Tenterden	*Kent*	51 4	*0 41	190	3·48	3·43
Arundel (Patching)	*Sussex*	50 51	0 27	130	4·01	2·87
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	4·07	3·22
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	2·82	2·80
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	2·61	...
Shoeburyness	*Essex*	51 31	*0 48	13	2·31	1·93
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·72	1·96
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·84	2·44
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·84	2·96
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·81	3·86
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	3·21	1·95
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·77	2·10
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	3·20	1·94
Boston	*Lincolnshire*	52 58	0 1	11	2·75	2·08
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	2·77	2·43
Macclesfield	*Cheshire*	53 15	2 7	501	3·53	1·84
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	3·74	2·47
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·48	3·07
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	3·18	1·93
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	3·19	2·27
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·20	2·40
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	12·71	3·46
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·87	2·50
Haverfordwest	*Pembroke*	51 48	4 58	90	5·51	2·75
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	5·38	1·54
Llandudno	*Carnarvon*	53 20	3 50	72	3·78	1·21
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·45	1·44
Marchmont House	*Berwick*	55 44	2 24	498	3·83	2·20
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·38	2·21
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·36	1·17
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·50	2·94
Mull (Quinish)	,,	56 34	6 13	35	5·87	2·95
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·81	2·42
Braemar	*Aberdeen*	57 0	3 24	1114	3·88	2·23
Aberdeen (Cranford)	,,	57 8	2 7	120	3·23	3·07
Cawdor	*Nairn*	57 31	3 57	250	2·95	·83
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·14	·79
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·38	3·10
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·15	1·44
Wick	*Caithness*	58 26	3 6	77	3·14	1·92
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·59	3·39
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·00	2·14
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·48	2·48
Ennistymon House	*Clare*	52 57	9 18	37	4·40	2·77
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·75	2·30
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·53	1·84
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·88	1·24
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·19	1·17
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·27	3·29
Cong (The Glebe)	,,	53 33	9 16	112	4·60	2.54
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·21	2·12
Seaforde	*Down*	54 19	5 50	180	3·65	1·63
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·60	1·81
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·76	1·76

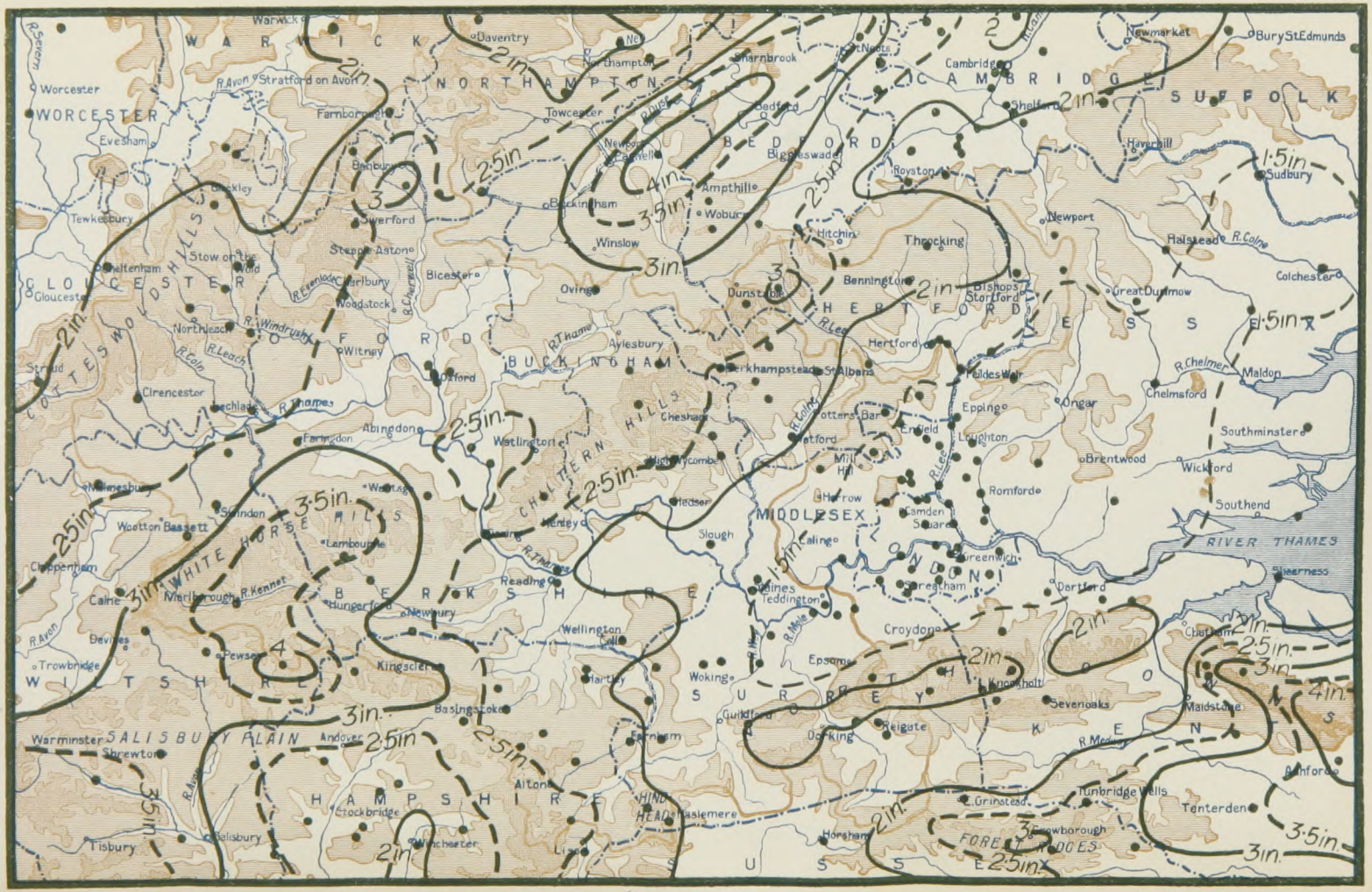
RAINFALL TABLE FOR OCTOBER, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
—1·47	46	·28	25	13	20·64	15·88	—4·76	77	25·11	Camden Square
— ·05	99	1·23	29	16	21·80	20·82	— ·98	96	27·64	Tenterden
—1·14	72	·60	29	14	24·03	22·18	—1·85	92	30·48	Patching
— ·85	79	·77	28	16	25·25	25·03	— ·22	99	31·87	Cadland
— ·02	99	·87	14	12	20·27	19·23	—1·04	95	24·58	Oxford
...	...	...	...	...	20·81	...	..	...	25·17	Croyland Abbey
— ·38	84	·59	29	14	15·48	13·31	—2·17	86	19·28	Shoeburyness
— ·76	72	·53	25	14	20·86	17·74	—3·12	85	25·40	Westley
— ·40	86	·66	29	24	19·17	16·14	—3·03	84	23·73	Geldeston
—1·88	61	·51	31	15	29·74	33·67	+3·93	113	38·27	Polapit Tamar
+ ·05	101	·79	31	16	26·35	31·21	+4·86	118	33·54	Rousdon
—1·26	61	·37	14	13	24·33	21·49	—2·84	88	29·81	Stroud
—1·67	56	·54	26	15	26·48	23·53	—2·95	89	32·41	Wolstaston
—1·26	61	·39	25	14	23·71	16·10	—7·61	68	28·98	Coventry
— ·67	76	·50	25	18	19·42	15·27	—4·15	79	23·35	Boston
— ·34	88	·52	25	14	20·31	15·19	—5·12	75	24·46	Hodsock Priory
—1·69	52	·76	25	12	28·38	29·22	+ ·84	103	34·73	Macclesfield
—1·27	66	·79	25	9	26·44	23·46	—2·98	89	32·70	Southport
—3·41	47	1·04	25	15	48·62	41·09	—7·53	85	61·49	Arncliffe
—1·25	61	·60	25	9	22·26	18·79	—3·47	84	26·87	Ribston Hall
— ·92	71	·66	25	13	21·76	17·75	—4·01	82	26·42	Hull
— ·80	75	·69	29	15	22·85	20·50	—2·35	90	27·94	Newcastle
—9·25	27	1·03	25	13	100·75	87·55	—13·20	87	129·48	Seathwaite
—2·37	51	·70	25	13	33·50	36·60	+3·10	109	42·28	Cardiff
—2·76	50	·77	25	13	36·47	35·91	— ·56	98	46·81	Haverfordwest
—3·84	29	·48	25	17	36·30	34·76	—1·54	96	45·46	Gogerddan
—2·57	32	·57	25	12	24·33	20·83	—3·50	86	30·36	Llandudno
—3·01	32	·83	25	10	34·28	32·02	—2·26	93	43·47	Cargen
—1·63	57	·60	25	18	27·72	19·40	—8·32	70	33·76	Marchmont
—3·17	41	·98	25	13	39·05	38·08	— ·97	98	49·77	Girvan
—2·19	35	·47	25	14	28·39	23·83	—4·56	84	35·97	Glasgow
—3·56	45	·50	2, 26	17	52·71	52·20	— ·51	99	68·67	Inveraray
—2·92	50	·43	27	17	43·74	39·92	—3·82	91	56·57	Quinish
— ·39	86	·50	25	17	23·35	18·91	—4·44	81	28·64	Dundee
—1·65	58	·49	29	15	28·04	23·94	—4·10	85	34·93	Braemar
— ·16	95	·58	25	18	26·01	20·95	—5·06	81	32·73	Aberdeen
—2·12	28	·46	26	2	24·20	19·34	—4·86	80	29·33	Cawdor
—3·35	19	·26	26	11	34·40	26·86	—7·54	78	44·53	Fort Augustus
—5·28	37	·61	5	16	65·17	69·50	+4·33	107	83·93	Bendamph
—1·71	46	·49	25	15	25·56	22·57	—2·99	88	31·90	Dunrobin Castle
—1·22	61	..	...	...	23·82	21·34	—2·48	90	29·88	Wick
—2·20	61	·83	28	12	42·35	47·33	+4·98	112	54·81	Killarney
—1·86	54	·62	25	10	31·45	28·01	—3·44	89	39·57	Waterford
—1·00	71	·54	27	10	31·21	30·24	— ·97	97	39·43	Castle Lough
—1·63	63	·57	11	13	36·87	39·89	+3·02	108	46·52	Ennistymon
—1·45	61	·70	25	11	28·16	25·00	—3·16	89	34·99	Courtown Ho.
—1·69	52	·52	31	11	29·23	27·72	—1·51	95	35·92	Abbey Leix
—1·64	43	·48	31	12	22·77	17·06	—5·71	75	27·68	Dublin
—2·02	37	·47	31	9	29·38	27·75	—1·63	94	36·15	Mullingar
—1·98	62	·67	24	16	41·01	39·88	—1·13	97	52·87	Enniscoe
—2·06	55	·76	25	11	38·48	38·85	+ ·37	101	48·90	Cong
—2·09	50	·84	25	16	34·35	34·75	+ ·40	101	42·71	Markree
—2·02	45	·78	25	7	31·28	24·44	—6·84	78	38·91	Seaforde
—1·79	50	·81	25	15	29·92	25·58	—4·34	86	37·56	Dundarave
—2·00	47	·72	25	15	31·81	29·16	—2·65	92	39·38	Omagh

SUPPLEMENTARY RAINFALL, OCTOBER, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	2·12	XI.	Lligwy	1·38
,,	Ramsgate	3·37	,,	Douglas	1·91
,,	Hailsham	2·61	XII.	Stoneykirk, Ardwell House...	2·16
,,	Totland Bay, Aston House...	3·78	,,	Dalry, The Old Garroch.....	...
,,	Stockbridge, Ashley..	2·32	,,	Beattock, Kinnelhead	2·28
,,	Grayshott	2·31	,,	Langholm, Drove Road	1·42
III.	Harrow Weald, Hill House...	1·73	XIII.	Meggat Water, Cramilt Lodge	1·68
,,	Caversham, Rectory Road ...	2·07	,,	North Berwick Reservoir.....	2·07
,,	Pitsford, Sedgebrook...	1·89	,,	Edinburgh, Royal Observaty.	1·23
,,	Woburn, Milton Bryant.....	3·27	XIV.	Maybole, Knockdon Farm ...	1·56
,,	Chatteris, The Priory..... ...	2·32	XV.	Ballachulish House	3·00
IV.	Elsenham, Gaunts End	1·51	,,	Campbeltown, Witchburn ..	2·48
,,	Colchester, Hill Ho., Lexden	1·28	,,	Holy Loch, Ardnadam.....	3·56
,,	Ipswich, Rookwood, Copdock	1·89	,,	Islay, Eallabus	3·33
,,	Blakeney	1·43	,,	Tiree, Cornaigmore	3·01
,,	Swaffham	2·05	XVI.	Dollar Academy	1·98
V.	Bishops Cannings	3·28	,,	Balquhidder, Stronvar.....	2·22
,,	Wimborne, St. John's Hill ...	3·42	,,	Glenlyon, Meggernie Castle..	1·85
,,	Ashburton, Druid House.....	4·14	,,	Blair Atholl	1·34
,,	Cullompton	3·71	,,	Coupar Angus	2·51
,,	Lynmouth, Rock House	3·80	,,	Montrose, Sunnyside Asylum.	2·78
,,	Okehampton, Oaklands... ...	4·18	XVII.	Alford, Lynturk Manse	3·47
,,	Hartland Abbey.....	2·52	,,	Fyvie Castle	3·34
,,	Probus, Lamellyn.....	3·30	,,	Keith Station	2·41
,,	North Cadbury Rectory.....	2·71	XVIII.	Rothiemurchus	·93
VI.	Clifton, Pembroke Road.....	2·06	,,	Loch Quoich, Loan	5·40
,,	Ross, The Graig	1·81	,,	Drumnadrochit	·71
,,	Shifnal, Hatton Grange.....	1·59	,,	Skye, Dunvegan	4·86
,,	Droitwich.....	1·70	,,	Lochmaddy, Bayhead	2·77
,,	Blockley, Upton Wold.....	2·07	,,	Glencarron Lodge	2·60
VII.	Market Overton.....	2·76	XIX.	Invershin	1·12
,,	Market Rasen	2·08	,,	Melvich	2·31
,,	Bawtry, Hesley Hall	2·05	,,	Loch Stack, Ardchullin	4·19
,,	Derby, Midland Railway.....	1·99	XX.	Skibbereen Rectory	2·71
,,	Buxton	3·18	,,	Dunmanway, The Rectory ..	2·86
VIII.	Nantwich, Dorfold Hall	1·23	,,	Glanmire, Lota Lodge.....	1·50
,,	Chatburn, Middlewood	2·04	,,	Mitchelstown Castle.....	1·37
,,	Cartmel, Flookburgh	..	,,	Darrynane Abbey.....	3·78
IX.	Langsett Moor, Up. Midhope	2·72	,,	Clonmel, Bruce Villa	1·65
,,	Scarborough, Scalby	2·22	,,	Newmarket-on-Fergus, Fenloe	2·17
,,	Ingleby Greenhow	2·80	XXI.	Laragh, Glendalough	1·76
,,	Mickleton	2·25	,,	Ballycumber, Moorock Lodge	1·75
X.	Bellingham, High Green Manor	2·32	,,	Balbriggan, Ardgillan	2·05
,,	Ilderton, Lilburn Cottage ...	2·49	XXII.	Woodlawn	1.72
,,	Keswick, The Bank.....	1·43	,,	Westport, St. Helens	2·81
XI.	Llanfrechfa Grange	2·94	,,	Dugort, Slievemore Hotel ...	3·40
,,	Treherbert, Tyn-y-waun	4·73	,,	Mohill Rectory	2·16
,,	Carmarthen, The Friary	2·56	XXIII.	Enniskillen, Portora.....	1·80
,,	Castle Malgwyn [Llechryd]...	..	,,	Dartrey [Cootehill]	2·23
,,	Crickhowell, Tal-y-maes.....	4·30	,,	Warrenpoint, Manor House ..	2·27
,,	New Radnor, Ednol	3·10	,,	Banbridge, Milltown	1·18
,,	Birmingham WW., Tyrmynydd	3·44	,,	Belfast, Cave Hill Road	1·85
,,	Lake Vyrnwy	2·16	,,	Glenarm Castle..... ...	...
,,	Llangyhanfal, Plâs Draw.....	1·74	,,	Londonderry, Creggan Res...	1·73
,,	Dolgelly, Bryntirion.....	1·58	,,	Dunfanaghy, Horn Head ...	2·10
,,	Bettws-y-Coed, Tyn-y-bryn...	2·56	,,	Killybegs	3·23

THAMES VALLEY RAINFALL. — OCTOBER, 1914.



THE WEATHER OF OCTOBER.

THE month was dry and mild with remarkably high and steady barometer over practically the whole of the United Kingdom, and few stations received so much as the average rainfall. A marked anticyclone remained central over the southern part of the Kingdom, where the first 12 days were rainless. This, following on the dry period in the latter part of September, constituted an absolute drought of 22 days' duration. At many stations the drought lasted for 25 days. Temperature was high for the time of the year, the shade maximum on the 3rd reaching 70° at Scarborough and 69° at Clacton and Greenwich. Readings over 60° occurred at almost all stations between the 5th and 10th, and so far north as Balmoral the temperature reached 67°, and at Gordon Castle 66°. On the 12th the barometer fell in the south, a small depression passing slowly up the Channel, and on the 14th more than 1 inch of rain fell at many stations in the south Midland counties. At Newport Pagnell 2·21 in. was measured, rain falling heavily from 4 to 9 p.m., with very heavy bursts at intervals. At Brampton the fall was 1·51 in., at Huntingdon 1·40 in., and at Great Paxton 1·28 in. From the 15th to the 20th the barometer again became high and steady and the minimum temperatures of the month were recorded on the 15th at many places in Scotland and Ireland, the lowest reported being 19° at Balmoral, 27° at Markree, and 28° at Nairn and West Linton. From the 21st to 24th a shallow depression moved from the south of Ireland to the north-east of England, and while the weather was practically rainless in part of western Scotland, over the east and south of Great Britain rain fell on most days. On the 22nd 1·57 in. fell at Brecon, 1·16 in. at Tyn-y-waun, 1·10 in. at Nettlebed, and 1·03 in. at Wexcombe. Heavy rain fell over a wide area in the west of Great Britain and in Ireland on the 25th. At Fofany the measurement was 2·13 in., and at Dungeon Ghyll 1·43 in. On the 27th the barometer gradient showed a steady fall from south to north, a condition which was inverted on the 29th, when thunder and lightning occurred at Waterford and Dublin, and heavy rain and hail fell at several stations in Kent with easterly wind. On our north-eastern coasts a heavy easterly gale raged on the 29th and 30th, during which the hospital ship "Rohilla" was wrecked off Whitby and 70 lives were lost. A strong south-east gale and heavy rain were experienced on the 31st over the south-west of England, the heaviest falls reported being 1·47 in. at Moretonhampstead and 1·40 in. at Spreyton.

The duration of sunshine exceeded 100 hours at several stations in the south and west of England, Falmouth having 117·4 hours, Haverfordwest 104·5 hours, and Totland Bay 102·7 hours. Other records were, Tenterden 86·0 hours, Sidmouth 96·3 hours, Matlock Bath 61·2 hours, Bolton 39·2 hours, Southport 70·8 hours, Hull, 59·2 hours, Marchmont 59·9 hours, Killearn 61·9 hours, Oban 64·7 hours, and Loch Stack 59·1 hours.

At many stations there was a total absence of frost, and at places as far north as Ilderton and Whithorn, roses, fuchsias, and other tender plants were still in bloom at the end of the month.

In London the dry spell in the latter part of September continued until October 12th, after which rain fell on most days but the amounts were never large. Temperature remained high, the mean temperature at Camden Square being 52°·0 or 1°·9 above the average. Not since January last has the mean temperature of the month been below the average. The total evaporation was ·70 in. and the duration of rainfall 31·0 hours. The duration of sunshine, 56·6 hours, was the least for October since 1904.

The general rainfall over the Kingdom expressed as a percentage of the average was as follows : England and Wales, 60 ; Scotland, 47 ; Ireland, 55 ; British Isles, 55.

Climatological Table for the British Empire, May, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	82·9	22	37·7	26	65·5	45·4	45·8	72	124·6	32·2	1·74	8	5·5
Malta	78·1	24	56·5	13	70·2	62·0	...	79	129·0	...	·04	1	1·8
Lagos	91·0	1, 4	72·0	23	88·0	77·6	75·1	76	156·0	70·0	12·03	14	7·9
Cape Town	78·5	14	39·9	18	67·4	52·9	54·2	83	...	...	2·48	13	5·2
Natal, Durban ...	73·0	2, 11	57·0	11*	69·5	61·1	59·7	76	...	...	·27	3	3·6
Johannesburg	73·1	9	40·0	30	66·2	46·9	42·7	70	...	34·5	·40	3	1·9
Mauritius	82·5	9	57·5	30	79·4	65·9	65·0	78	...	50·7	2·87	20	5·2
Bloemfontein	73·9	4	36·2	31	68·1	44·0	38·6	59	...	...	1·25	5	3·4
Calcutta...	96·5	3	71·7	18	92·6	77·9	75·8	77	...	67·6	8·39	7	5·5
Bombay...	93·4	15	80·2	2	92·0	81·9	76·9	74	137·1	73·0	·00	0	3·1
Madras	108·9	31	78·2	6	100·5	82·0	74·5	68	159·2	77·2	·01	1	3·9
Colombo, Ceylon ...	92·2	4	72·0	3	88·3	77·7	76·0	80	160·3	70·0	14·32	18	7·3
Hongkong	90·8	21	66·9	3	82·8	75·3	72·2	80	...	...	12·62	16	7·2
Sydney	73·9	3	44·6	28	66·2	54·6	49·9	75	123·3	38·1	3·17	21	5·0
Melbourne	75·2	11	40·5	16	62·3	47·4	46·6	72	126·2	33·9	2·54	14	6·4
Adelaide	80·8	3	39·8	21	67·2	50·7	48·1	69	136·4	30·8	1·35	13	5·0
Perth	84·8	7	34·3	11	68·3	49·1	47·0	63	139·1	25·5	1·82	12	4·5
Coolgardie	91·8	1	34·8	12	68·5	46·5	42·2	52	149·2	29·4	·03	2	3·7
Hobart, Tasmania ..	70·3	11	38·1	16	58·6	44·7	41·9	67	117·0	30·9	·97	14	5·8
Wellington	63·6	5	35·2	24	55·6	45·2	44·9	82	118·8	26·0	7·97	20	7·7
Auckland	65·0	5	39·0	23	59·6	48·5	48·5	81	127·0	44·0	4·71	19	5·3
Jamaica, Kingston ..	93·8	27	70·6	2	89·6	73·0	70·0	72	...	...	·80	4	4·4
Grenada	88·0	4	70·0	21	82·4	75·0	...	76	136·0	...	3·95	16	5·8
Toronto	87·0	21	34·8	1	69·7	47·4	44·0	61	103·8	32·6	1·50	12	4·0
Fredericton	90·0	26	25·5	17	66·2	39·5	...	68	...	...	1·06	7	5·2
St. John, N.B. ...	78·2	27	27·5	1	55·5	40·3	38·0	78	...	...	·59	11	6·7
Edmonton, Alberta ...	80·2	31	30·1	6	64·0	39·3	...	49	134·8	20·0	1·93	11	4·5
Victoria, B.C.	81·3	21	42·0	1	64·2	47·6	43·0	66	...	...	·18	4	3·6

* 26, 28 and 31.

Johannesburg.—Bright sunshine 265·9 hours.

Mauritius.—Mean temp of air. 0°·2, dew point 0°·5 above, and R ·40 in. below averages. Mean hourly velocity of wind 9·61 miles, or ·66 mile below average.

COLOMBO.—Mean temp. of air 83° or 0°·3 above, of dew point 0°·2 above and R 3·19 in. above, averages. Mean hourly velocity of wind 6·4 miles. TSS on 8 days.

HONGKONG.—Mean temp. of air 78°·5, mean hourly velocity of wind 11·4 miles. Bright sunshine 191·5 hours.

Sydney.—Average temp. 1°·9 above the 55 year's average.

Melbourne.—Mean temp. of air 0°·8 above and R ·38 in. above, averages.

Adelaide.—Mean temp. of air 1°·3 above, and R 1·37 in. below, averages.

Coolgardie.—Temp. of air 0°·1 below, and R 1·25 in. below, averages.

Hobart.—Temp. of air 1°·2 above, and R ·91 in. below, averages.

Wellington.—Mean temp. of air 2°·4 below, and R 3·17 in. below, averages. Bright sunshine 99·4 hours.

Auckland.—Mean temp. of air 3°·0 below, and R slightly above, averages; a showery and stormy month.

ALBERTA.—A sunny, dry, rather warm month with rain slightly above average

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METEOROLOGY IN NEW ZEALAND.

By The Editor.

One of the good results of a particularly ill wind was the opportunity recently presented to me of paying a long visit to the Dominion of New Zealand, a visit the projected length of which was doubled as a consequence of the disorganization of traffic, resulting from a great strike of wharf labourers.

During the three-and-a-half months which I spent there I saw much of the Dominion Meteorologist, Mr. D. C. Bates, whose acquaintance I had formed by correspondence nearly twenty years before, and for whose energy and enthusiasm I was well prepared. I have now to acknowledge with gratitude the personal kindness I received from him, not only in Wellington, but through his introductions in all parts of the Dominion. Although at the time I was not able to take full advantage of the opportunities which Mr. Bates so generously placed at my disposal, for making a complete study of the meteorological system of New Zealand, I was yet able, in the course of a tour, which extended from Stewart Island in the south, to the Bay of Islands in the north, to visit a large number of meteorological stations, and to make the acquaintance of many of the Observers. For facilitating this journey I must specially acknowledge the courtesy of the Government in connection with the Tourist Department and the railways.

It is always difficult for those at home to realise the conditions of a distant land, and in the case of New Zealand this difficulty is increased by the extremely close resemblance of the details of life to those at home. Indeed, of all the overseas dominions, colonies, or other possessions of the British Crown which I have visited, and I have had the good fortune to travel in most of them, New Zealand is the only one in which at times one could forget that one was not in England. The smoothness of the routine of all the essentials of civilised life makes it the more difficult to realise the difference in the conditions under which the various departments at work are carried on. From the meteorological point of view

this is particularly the case. New Zealand is scarcely smaller in area than the British Isles, but it ranges through a greater stretch of latitude, reaching as it does for nearly 1000 miles from north to south, from latitude 34° S. to latitude 47° S. The first feature of the climate which strikes a visitor from the old country is that despite the fact that the whole of Great Britain lies nearer to the Pole than any part of New Zealand, the climates of the two are singularly alike; indeed, the summer in the South Island of New Zealand struck me as certainly no warmer and decidedly more capricious in the alternations of temperature, than that of England. The lower latitude, however, insures a greater intensity of sunlight and correspondingly shorter days in the summer and shorter nights in the winter, and the evidence of vegetation proves conclusively that the mean temperature of the winter is much higher in New Zealand than in Great Britain. The climate of the west of Ireland may, indeed, be compared very closely with that of the extreme south of New Zealand. The luxuriance of vegetation in Stewart Island is suggestive of Co. Kerry, where many of the native New Zealand plants flourish as well as in their native home.

It is one of the most remarkable features of that unique little island, which assuredly should have retained its poetic Maori name of Rakiura, the Land of the Glowing Sky, that one seems to move in a temperate, and indeed a cool, temperate climate, amidst a vegetation of quite tropical appearance, tree ferns with other ferns and mosses clothing the land right down to the water's edge, while forest trees hung with climbers of very varied appearance, join with the undergrowth, making the interior practically impenetrable unless a way is cut.

The physical features of New Zealand differ completely in the two main islands. In the South Island the west is occupied by a continuous mountain range, rising in most places far above the snow line. For most of its length this cuts off communication between the two sides of the island, except for mountaineers able to negotiate snow passes. The few towns on the west coast are all at the northern end and they had only precarious communication by sea until the recent construction of railways, carried through difficult passes. The east of the South Island, on the contrary, is a continuous plain sloping gently from the western mountains to the sea, broken here and there with low hills which, when they reach the coast, form shelter for the few good harbours the island possesses. The South Island lies in the zone of the Roaring Forties, the prevailing wind being from the west, with the consequence that the western slopes of the mountains receive a very heavy rainfall, exceeding 100 inches in many places, while the grassy plains of the east have a rainfall below that of the eastern counties of England, much of the area having an average of less than 20 inches of rain. The North Island consists of a

great volcanic plateau in the centre, from which ridges of rocky hills run outwards in all directions to the sea, isolating between them comparatively small stretches of fertile plains and opposing great obstacles to convenient communication. The fine harbour of Wellington in the south, on the strait which separates the two islands, is connected by the Main Trunk railway line with the fine harbour of Auckland, in the northern peninsula, and with the less satisfactory seaports of New Plymouth on the west and Napier on the east. The climate of the North Island, on account of its latitude, is decidedly warm in summer, and although rarely cold enough for the formation of frost at sea level in winter, it is subject to cold winds, giving a marked contrast between the two seasons. The great Pacific Ocean extends north and east of New Zealand, on the south the Southern Ocean stretches to the Antarctic regions, and on the west the Tasman Sea which probably most people at home compare in breadth to the North Sea, is more comparable to the Atlantic Ocean, being wide enough to separate New Zealand from the continental influence of Australia. The whole population of New Zealand scarcely exceeds one million, and the problem of studying the climatology and meteorology of this long, narrow strip of sea-engirdled land is in consequence enormously greater than that of studying similar conditions in any European country.

The Meteorological Office has, until now, been under the Marine Department of the Government, and has been viewed more from the standpoint of weather than from that of climate by the authorities. The principal duties expected from the Office are the prediction of weather for the sailor and the farmer, and for this purpose arrangements have been made for the establishment of a considerable number of second order stations in the Dominion, and for obtaining telegraphic reports from a few points in Australia. There has recently been added a wireless service from Macquarie Island in the Southern Ocean, and from the Chatham Islands in the Pacific Ocean, but the total number of stations, the data of which have to be compared, is regrettably small. New Zealand is fortunate in possessing in Mr. Bates a born forecaster, who, though he works by rule, has a natural instinct for the interpretation of the phenomena with which he deals, and he certainly deserves the extraordinary personal popularity which he enjoys on land and sea in every part of the Dominion. To anyone accustomed to the ill-informed and captious criticism of the British public on the weather forecast submitted to them daily, the confidence with which all the affairs of life are arranged on the suggestions of the New Zealand weather forecast, appears the most wonderful thing in the meteorology of that country. It may be that the weather conditions there are simpler and the prognostics therefore less liable to misinterpretation than they are in the more complicated conditions of western Europe; it certainly appeared

to me that the changes and movements of clouds in New Zealand were more expressive of weather change than those at home, and Mr. Bates makes large use of the appearance and movements of clouds in filling up the gaps in his telegraphic reports.

Of the meteorological stations which I visited, the most complete was naturally that at Wellington, in connection with the Meteorological Office. It is situated at sea-level and amongst its self-recording instruments there is a Dines' anemometer, the indications of which can be compared with those of a similar instrument established at the wireless telegraphic station a few miles distant, at an elevation of nearly 1000 feet. It was a little remarkable to find that the sunshine recorder was provided with cards graduated for the northern hemisphere, so that the morning record was on the p.m. half, and the evening record on the a.m. half of the card. The point is a slight one, but affords a very striking demonstration of the fact that the sun in the southern hemisphere travels around the sky from right to left, instead of from left to right, as in the northern. The highest meteorological station which I visited was that on the slopes of Mt. Egmont, or as the Maoris poetically named it, Taranaki, the Cloud Piercer. It is a simple climatological station at an altitude of nearly 3000 feet, and from its position just above the tree line, on the side of the great cone which sweeps upwards in isolated grandeur from the surrounding plain, it is peculiarly adapted for a high level station, and will be one day, I hope, supplemented by observations on the actual summit, 8250 feet above the sea. The meteorological stations in Auckland and Christchurch were both thoroughly efficient and admirably kept, but of all those which I saw in New Zealand the most distinctive was that in the Park at Rotorua, in the centre of the Hot Lake District. Rotorua may be looked upon from the tourist point of view as the heart of Old New Zealand, the centre of the picturesque Maori life and the paling surrounding the meteorological instruments takes the quaintly appropriate form of the palisade of a Maori *Pah*, with the large grave faces of the ancestral carvings capping the posts.

It is altogether surprising to find how solid a beginning has been made in meteorological investigation in a country where, as we were reminded by an inscription in the Bay of Islands, the first missionary landed among cannibals on December 25th, 1815, and where Colonial Government only commenced in 1840; and there are strong indications of rapid development in scientific research, as well as in material progress, amongst the rising generation of native born New Zealanders, whose ancestral character has already laid the foundation of a New Britain, reflecting all the robust qualities of the Mother Country.

BRITISH ASSOCIATION AUSTRALIA MEETING, METEOROLOGICAL LUNCHEON.

By Ernest Gold, M.A.

The Meteorological Luncheon was held at the Grand Hotel, Melbourne, on Tuesday, August 18th, immediately before a deputation of Cosmical Physicists waited on the Prime Minister to urge the importance of establishing an Observatory of Solar Physics in Australia. Mr. Hunt, Commonwealth Meteorologist, presided over a company which included Mr. Hutchinson, the Minister of Agriculture, Mr. Knibbs, the Commonwealth Statistician, and two representatives of the Australasian Steamship Owners' Federation, viz., Mr. W. T. Appleton, Managing Director of Huddart Parker, Ltd., and Mr. D. J. Syme, Chairman of Directors, Melbourne Steamship Company. The following is a list of those present :—

Dr. C. G. Abbot
The Minister of Agriculture
E. C. Andrews
G. F. Ainsworth
W. T. Appleton
J. R. Baldwin
R. J. A. Barnard
Prof. E. W. Brown
H. Buckley
Dr. Cameron
Mrs. Cameron
Dr R. T. Chamberlin
Prof. W. M. Davis
H. T. Ferrar
E. L. Fowles
E. Gold
Mrs. Gold
W. Catton-Grasby
R. F. Griffiths
Dr. T. H. Havelock
H. A. Hunt
H. M. Joscelyne
G. H. Knibbs
Dr. A. Lauder
W. F. Lawry
Prof. S. B. McLaren
Prof. Albrecht Penck
E. T. Quayle
A. E. V. Richardson
Miss Seward
Dr. G. C. Simpson
D. Y. Syme
Griffith Taylor
Prof. H. H. Turner

After the toast of "The King," and a few words of welcome from the Chairman, Professor H. H. Turner proposed the toast of "Australian Meteorology." As several of those present had to leave early for the deputation to the Prime Minister, Prof. Turner craved the indulgence of the company while he sang a song which would be briefer than a speech. The song met with such approval that I have asked Prof. Turner to allow it to be published here. It runs :—

A SONG OF METEOROLOGY.

Melbourne, 1914.

Some talk of Astrophysics, and some of Educa-
Tion, while shells and bullets whizz, sixteen thousand miles away,*
No disrespect is meant them, nor yet to Botany,
If we sing just now, with a tow-row-row, of Meteorology.

* Really only 13,000, but that won't rhyme.

Some use the millimetre, and some the millibar,
And for the Thermometer, there's Reaumur, Cent., and Fahr.;
But we'll sink all such distinctions, united let us be,
When we sing right now, with a tow-row-row, of Meteorology.

Some like the Dirigible, and some the Aeroplane,
We need not stop to quibble, the points of both are plain;
But let me make confession, the dream of bliss for me,
Is to go to the moon with a "sounding balloon," for Meteorology.

There's some that's fond of roses, in gardens or in rooms,
And some of country posies, and some of hothouse blooms;
Let each man have his fancy, the *Rose of the Winds* for me,
That lovely flower I draw by the hour for Meteorology.

We sometimes toast "Our Sweethearts," and sometimes "Absent Friends,'
Both these will cause to beat hearts, till human nature ends;
But I pray you drink in bumpers, the toast that appeals to me.
Which is "Hip Hooray for Australia, and Meteorology."

Tune—"*The British Grenadiers.*"

The Minister of Agriculture proposed the toast of the "Overseas Members." He said how delighted he had been to meet so many of the distinguished scientists who had come to take part in this Congress in Australia. He had noted the keen interest and enthusiasm for scientific development and research in the subject with which he was more intimately associated, and which depended so much for its practical success in Australia, upon a knowledge of the weather from day to day, and from season to season. He did not doubt that the same keenness characterized the meteorologists and he hoped that their efforts would meet with the success which they deserved.

Mr. Gold replied on behalf of the overseas members, who had met everywhere with the most cordial hospitality. They had expected much after the speech at Sheffield, in which Sir George Reid invited them to come to Australia, but the heartiness of Australian welcome exceeded their expectations.

He had been impressed by the way in which every newspaper published not merely a forecast or weather report, but a daily chart showing the distribution of the meteorological elements over the whole continent. A great future lay before meteorology in Australia, and he anticipated that seasonal forecasts would, before long, find successful application there. He might be permitted to say a few words on a department with which he had been closely associated, and following Professor Turner's example he would give them in rhyme.

THE BALLAD OF THE STRATOSPHERE.

I am the rolling Stratosphere,
  I long to perturbate;
So I tickle the top of the troposphere
  To make him undulate.

My temperature is 215 (two-fifteen),
  On Kelvin's absolute scale,
Though it's never been taken in a louvred screen.
  It has in a comet's tail.

I rule the air beneath my feet,
  I'm in a stable state,
When the sun is shining through a cirrus sheet
  My base I elevate.

I was discovered, most men agree,
  By Teisserenc de Bort;
From Trappes his balloons he sent floating free
  Through my "Great Inversion" floor.

In England Dines has found me out
  With instrument so light;
And my secrets he's sought with courage devout,
  And correlation might.

But no correlation ratio,
  For kilometres nine,
Can explain to me why a small shallow low
  Brings rain from the land of wine.

Where Simpson made a dash for me
  Antarctic East wind blows;
So he tried calm days when (see Admiral B.),
  Smoke vertically rose.

I am the rolling Stratosphere,
  I keep, need I relate,
By the radiation of the Atmosphere
  In a thermal steady state.

At the request of the Commonwealth Statistician Professor Penck spoke on behalf of the foreign guests. He expressed his great pleasure at being present at that gathering and his deep sense of the kindness which was shown to him everywhere. Among so many new impressions one in particular had appealed especially to him, viz., the difficulty of making a forecast which applied to a continent, and the successful way in which the meteorologists of Australia were doing this.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

PROPOSED RE-ARRANGEMENT OF THE SEASONS.

In 1905 I sent to *Nature Notes* (now called *The Selborne Magazine*) a statement of my views on the above subject. I proposed to commence Spring on March 21st, and to extend it only as far as May 21st. Summer would begin on May 22nd, and continue until September 23rd. Autumn would occupy the period from September 24th to November 20th. Winter would extend from November 21st to March 20th. In *Nature Notes* I mention the fact that immediately after the Vernal Equinox the mean temperature rapidly ascends, tending to show that the real, living, active Spring commences about then.

My Winter has 120 days (leap-year 121); Spring has 62; Summer has 125; and Autumn has 58. Winter and Summer I call "predominant" seasons; Spring and Autumn "transitional." Winter and Summer are divided into early, mid, and late. The subject bristles with difficulties. With blackbirds and thrushes singing in the third week of January, amidst hazel-catkins, early snowdrops, and "rathe primroses," the season is already Spring, while mid-March, with its frosts, and occasionally a blizzard, tells us that Spring, even then, has not fairly commenced.

E. G. ALDRIDGE, F.R.Met.Soc.

Barnstable, November 20th, 1914.

SEASONAL LIMITS.

It may be, as Mr. Brodie suggests, reasonable to count summer as from the middle of May to the middle of September, and winter from the middle of November to the middle of March. But it is impossible to define the seasons logically, both with regard to the sun and air temperature, and neither point can be ignored in reference to the general climatic effect. For instance, according to the classification in use, or Mr. Brodie's, the latter part of winter has more daylight and stronger sun than the late autumn. This objection could only be avoided by arranging the winter season so as to make its middle day December 22nd; but in that case the early winter would be, normally, warmer than early spring.

G. WESTON.

The Vicarage, Bethersden, Kent, 2nd December, 1914.

The communication on Seasonal Limits, by Mr. Brodie, in your November issue, certainly suggests a very drastic change, and once again monthly periods are assailed. In my judgment, as a worker

for over 50 years, the months are the best divisions of the year, perhaps borrowing for February a day from both January and March.

The practice which has been so generally followed of grouping the several months into seasons, seems to have given satisfaction hitherto, and it has the advantage of being adpoted by all workers.

Whatever limits are assigned to the seasons, there must be at times winter in summer and summer in winter. Our weather is occasionally abnormal, why object to recording it as such? If hot days occur in the early part of September, as in 1906 and 1911, there are Septembers with cold days, as in 1912. In 1895 the hottest day of the year, 87°, occurred at Greenwich on September 24th, and in 1907 the hottest day of the year occurred on September 25th; neither of these would fall in Mr. Brodie's summer season.

Meteorologists are sorely tried just now with the new units of measurement, we scarcely want any shuffling up of our seasons, with no available standards for comparison.

CHAS. HARDING.

65. *Holmewood Gardens, Brixton Hill, 3rd December,* 1914.

RAIN IN THE LAST WEEK OF NOVEMBER.

THE first occasion on which we have had more than three consecutive falls of an inch in this century. The great proportion of it fell at night, and there was no abnormal flood even yesterday.

Nov. 24.	Nov. 25.	Nov. 26.	Nov. 27.	Nov. 28.	Nov. 29.	Nov. 30.	Total.
·31 in.	1·60 in.	1·20 in.	1·29 in.	1·09 in.	2·94 in.	·33 in.	8·76 in.

Total for November, 16·02 in. on 20 days.

GORDON WORDSWORTH.

The Stepping Stones, Ambleside, 1st December, 1914.

RAINFALL COMPARED WITH THE AVERAGE.

THE record of rainfall here, now extending to sixty-four years, affords a basis for comparison with the dry period which began in April last, and seems hardly yet to have come to an end. The rainfall of the seven months, April to October of this year, as compared with the average, is as follows :—

	April. in.	May. in.	June. in.	July. in.	August. in.	Sept. in.	Oct. in.	Total. in.
1914 ..	·64	1·38	1·60	1·65	·55	1·00	1·40	8·22
Mean 1851-1910	1·57	1·82	2·11	2·45	2·23	2·04	2·49	14·71

Though each month is decidedly below the mean of sixty years, yet no single month is absolutely the driest since 1851; but the total of the seven months is so, the nearest approach being in 1911. with 8·39 in.

If, however, we confine our attention to the four summer months, June—September, the case is not quite so exceptional.

June—Sept.			
1887.	1911.	1913.	1914.
4·70 in.	4·20 in.	4·79 in.	4·80 in.

There have been three drier summers during the period, but it will be seen that two of them are quite recent, in fact within the cycle of dry years through which we seem to be passing. At any rate it is worthy of note that the last four summers include three of the four driest since 1851. H. S. TABOR, F.R.Met.Soc.

Fennes, Braintree, 27th November, 1914.

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the Session was held on November 18th, at the Surveyors' Institution, Great George Street, Westminster. The chair was taken by Dr. H. N. Dickson, who explained that the President, Mr. C. J. P. Cave, M.A., was serving with the British forces on the continent.

A paper on "Isomeric Rainfall Maps of the British Isles," by Dr. H. R. Mill and Mr. Carle Salter, was read by the latter. In a paper too long to summarise adequately the authors referred to the earlier work of Mr. F. Gaster in *British Rainfall,* 1867 and 1868, and of Mr. H. Mellish, who submitted to the Society in 1900, maps, showing the percentage of annual rainfall which fell in each season, for the period 1866-1890, and was probably the first to treat the matter cartographically. The results of these authors were now largely confirmed, but it was shown that ten years was too short a period for variations due to exceptionally wet months to be smoothed out. The period now considered was the 35 years, 1875 to 1909, and the number of stations used was about 300, as uniformly distributed as possible. This period, although not fixing the monthly averages, probably indicates the normal type of seasonal march. The average monthly rainfall was expressed as a percentage of the average annual fall at each station, and the results were shown cartographically in twelve monthly and four seasonal maps, which are termed isomeric, the lines upon them indicating equal proportions of the annual average fall. The most interesting features were the occurrence of two types of seasonal march. The western, or wet districts, have a maximum fall in winter and a minimum in summer, while the eastern or dry districts show a maximum in summer and a minimum in winter. The equinoctial maps show the transitional stages between these two extremes, the spring months having everywhere a low rainfall, and small range, with a central maximum inland and a peripheral minimum around the coast, and the autumn months a large rainfall with a central minimum and a peripheral maximum. It was

shown that there is strong evidence for believing that the seasonal march depends upon the geographical position of the station.

Col. H. Mellish said that the results were substantially the same as those he arrived at in dealing with the 25 years 1866 to 1890. He found that January was the wettest month in the wet parts of the country, and very nearly the driest in some parts of the east of England. The lengths of the months considerably affected the averages, *e.g.*, in Nottingham the months January to April had nearly equal average rainfall, but the daily average showed January to be the driest and March the wettest of the four.

Mr. W. Marriot exhibited a series of slides showing various types of the seasonal march of rainfall.

Mr. J. Edmund Clark discussed 89 years' observations at York, in periods of varying length, the results going to prove the futility of short period workings for monthly averages.

Mr. E. Gold remarked that the isomeric distribution indicated that part of rainfall least liable to local variations depending upon elevation. Generally speaking places of high rainfall were also places of high temperature throughout the whole series.

Mr. L. C. W. Bonacina commented on the double oscillation between summer and winter and between spring and autumn rainfall. It would be interesting to ascertain if possible how much of the excessive rainfall of the west was due to orographic effect, and how much was cyclonic rainfall.

Mr. A. P. Jenkin, Mr. C. Harding, and Dr. H. N. Dickson then spoke, and Mr. Salter replied.

A paper on "A See-saw of Temperature between England and Egypt," by Mr. J. J. Craig, M.A., was taken as read, in the absence of the author. The author was induced to examine the annual and quarterly deviation from the normal of the temperatures of south-west England and Abbassia, Egypt, for the period 1877 to 1910, and a co-efficient of correlation was found. The four months January, April, July, and October, were then dealt with for a number of stations lying in the area north-west of Egypt, and the inter-relations more closely analysed to determine the position of the line of zero correlation. The results were embodied in maps of lines of equi-correlation, from which it appears that the region considered is divided into two, one homonomous with Egypt as regards deviation of mean temperature from its normal, the other heteronomous. The line of seasonal correlation passes not very far distant from Rome and runs from south-west to north-east, but is rather more east to west in winter, and more north to south in summer.

The following new fellows were elected to the Society: Mr. Isidor Block, Mr. F. C. Broad, Mr. G. F. Courcey-Breese, Mr. H. Gibson, Mr. Arthur Middenway, Mr. F. G. Parsons, Mr. Lala Kashi Ram, Rev. A. C. Ridsdale, M.A., Mr. A. W. C. Skelton, Mr. T. P. Speirs, Mr. F. H. Whalley.

RAINFALL TABLE FOR NOVEMBER, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·34	3·52
Tenterden	*Kent*	51 4	*0 41	190	3·07	4·46
Arundel (Patching)	*Sussex*	50 51	0 27	130	3·54	4·40
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	3·39	4·27
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·25	2·66
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·23	...
Shoeburyness	*Essex*	51 31	*0 48	13	2·09	2·50
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·40	2·99
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·49	2·80
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·07	4·93
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·51	3·88
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·77	3·52
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·94	4·51
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·61	3·09
Boston	*Lincolnshire*	52 58	0 1	11	2·05	2·34
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·98	2·34
Macclesfield	*Cheshire*	53 15	2 7	501	3·00	3·78
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	3·16	3·56
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·12	10·30
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·34	3·61
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·34	2·36
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·63	3·49
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·59	22·92
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·08	5·32
Haverfordwest	*Pembroke*	51 48	4 58	90	5·16	5·03
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·50	5·08
Llandudno	*Carnarvon*	53 20	3 50	72	3·19	3·79
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·35	6·11
Marchmont House	*Berwick*	55 44	2 24	498	3·21	4·41
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	5·32
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·63	3·97
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·39	10·37
Mull (Quinish)	,,	56 34	6 13	35	6·24	7·18
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·62	3·45
Braemar	*Aberdeen*	57 0	3 24	1114	3·76	6·02
Aberdeen (Cranford)	,,	57 8	2 7	120	3·29	4·01
Cawdor	*Nairn*	57 31	3 57	250	2·60	...
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·51	8·01
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·90	11·65
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·25	4·25
Wick	*Caithness*	58 20	3 6	77	2·95	4·12
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·54	4·81
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·80	4·05
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	5·51
Ennistymon House	*Clare*	52 57	9 18	37	4·62	6·55
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·41	3·38
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·28	3·37
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·64	3·26
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·38	4·38
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·75	6·46
Cong (The Glebe)	,,	53 33	9 16	112	5·00	6·78
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·02	5·66
Seaforde	*Down*	54 19	5 50	180	3·86	5·55
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·77	4·85
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·66	5·78

RAINFALL TABLE FOR NOVEMBER, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
+1·18	150	·70	30	18	22·98	19·40	—3·58	84	25·11	Camden Square
+1·39	145	1·37	30	19	24·87	25·28	+ ·41	102	27·64	Tenterden
+ ·86	124	1·00	30	16	27·57	26·58	— ·99	96	30·48	Patching
+ ·88	126	·78	30	22	28·64	29·30	+ ·66	102	31·87	Cadland
+ ·41	118	·50	4	19	22·52	21·89	— ·63	97	24·58	Oxford
...	...	...	...	...	23·04	...	...	...	25·17	Croyland Abbey
+ ·41	120	·73	15	21	17·57	15·81	—1·76	90	19·28	Shoeburyness
+ ·59	125	·96	28	16	23·26	20·73	—2·53	89	25·40	Westley
+ ·31	112	·62	28	25	21·66	18·94	—2·72	87	23·73	Geldeston
+ ·86	121	·55	14	21	33·81	38·60	+4·79	114	38·27	Polapit Tamar
+ ·37	111	·77	2	19	29·86	35·09	+5·23	117	33·54	Rousdon
+ ·75	127	·75	2	20	27·10	25·01	—2·09	92	29·81	Stroud
+1·57	153	·68	4	20	29·42	28·04	—1·38	95	32·41	Wolstaston
+ ·48	118	·77	2	20	26·32	19·19	—7·13	73	28·98	Coventry
+ ·29	114	·37	4	23	21·47	17·61	—3·86	82	23·35	Boston
+ ·36	118	·33	4	19	22·29	17·53	—4·76	79	24·46	Hodsock Priory
+ ·78	126	·81	11	18	31·38	33·00	+1·62	105	34·73	Macclesfield
+ ·40	113	·42	13	22	29·60	27·02	—2·58	91	32·70	Southport
+4·18	168	·98	29	22	54·74	51·39	—3·35	94	61·49	Arncliffe
+1·27	154	·63	15	19	24·60	22·40	—2·20	91	26·87	Ribston Hall
+ ·02	101	·35	4	23	24·10	20·11	—3·99	83	26·42	Hull
+ ·86	133	·53	15	26	25·48	23·99	—1·49	94	27·94	Newcastle
+9·33	169	2·86	29	21	114·34	110·47	—3·87	97	129·48	Seathwaite
+1·24	130	·80	30	27	37·58	41·92	+4·34	112	42·28	Cardiff
— ·13	97	·79	14	20	41·63	40·94	— ·69	98	46·81	Haverfordwest
+ ·58	113	·78	12	21	40·80	39·84	— ·96	98	45·46	Gogerddan
+ ·60	119	·50	9	19	27·52	24·62	—2·90	89	30·36	Llandudno
+1·76	140	·91	27	17	38·63	38·13	— ·50	99	43·47	Cargen
+1·20	137	·45	15	26	30·93	23·81	—7·12	77	33·76	Marchmont
+ ·08	102	·62	24	23	44·29	43·40	— ·89	98	49·77	Girvan
+ ·34	109	·67	29	21	32·02	27·80	—4·22	87	35·97	Glasgow
+2·98	140	1·60	29	22	60·10	62·57	+2·47	104	68·67	Inveraray
+ ·94	115	1·12	25	22	49·98	47·10	—2·88	94	56·57	Quinish
+ ·83	132	·54	5	20	25·97	22·36	—3·61	86	28·64	Dundee
+2·26	160	1·02	2	19	31·80	29·96	—1·84	94	34·93	Braemar
+ ·72	122	·58	1	25	29·30	24·96	—4·34	85	32·73	Aberdeen
..	...	...	...	...	26·80	...	...	...	29·33	Cawdor
+3·50	178	1·54	29	22	38·91	34·87	—4·04	90	44·53	Fort Augustus
+2·75	131	1·49	9	22	74·07	81·15	+ 7·08	110	83·93	Bendamph
+1·00	131	·60	1	19	28·81	26·82	—1·99	93	31·90	Dunrobin Castle
+1·17	140	..	...	...	26·77	25·46	—1·31	95	29·88	Wick
— ·73	87	·83	29	21	47·89	52·14	+4·25	109	54·81	Killarney
+ ·25	107	·74	14	19	35·25	32·06	—3·19	91	39·57	Waterford
+1·63	142	·98	14	18	35·09	35·75	+ ·66	102	39·43	Castle Lough
+1·93	142	·69	14, 29	19	41·49	46·34	+4·95	112	46·52	Ennistymon
— ·03	99	·89	15	19	31·57	28·38	—3·19	90	34·99	Courtown Ho.
+ ·09	103	·48	14	23	32·51	31·09	—1·42	96	35·92	Abbey Leix
+ ·62	123	·32	10	23	25·41	20·32	—5·09	80	27·68	Dublin
+1·00	130	·65	14	21	32·76	32·13	— ·63	98	36·15	Mullingar
+ ·71	112	·88	29	22	46·76	46·44	— ·42	99	52·87	Enniscoe
+1·78	136	1·03	14	18	43·48	45·63	+2·15	105	48·90	Cong
+1·64	141	·72	28	20	38·37	40·41	+2·04	105	42·71	Markree
+1·69	144	·71	14	23	35·14	29·99	—5·15	85	38·91	Seaforde
+1·08	129	1·20	5	22	33·69	30·43	—3·26	90	37·56	Dundarave
+2·12	158	·80	28	23	35·47	34·94	— ·53	99	39·38	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	4·37	XI.	Lligwy	4·43
,,	Ramsgate	3·24	,,	Douglas	4·52
,,	Hailsham	4·90	XII.	Stoneykirk, Ardwell House...	5·06
,,	Totland Bay, Aston House...	4·62	,,	Dalry, The Old Garroch.....	...
,,	Stockbridge, Ashley..	4·57	,,	Beattock, Kinnelhead	7·82
,,	Grayshott	4·54	,,	Langholm, Drove Road	7·42
III.	Harrow Weald, Hill House...	2·70	XIII.	Meggat Water, Cramilt Lodge	8·47
,,	Caversham, Rectory Road ...	2·29	,,	North Berwick Reservoir.....	2·48
,,	Pitsford, Sedgebrook.....	2·70	,,	Edinburgh, Royal Observaty.	2·62
,,	Woburn, Milton Bryant.....	3·05	XIV.	Maybole, Knockdon Farm ...	4·23
,,	Chatteris, The Priory..... ...	2·06	XV.	Ballachulish House	11·38
IV.	Elsenham, Gaunts End	2·78	,,	Campbeltown, Witchburn ..	5·81
,,	Colchester, Hill Ho., Lexden	2·20	,,	Holy Loch, Ardnadam.....	9·65
,,	Ipswich, Rookwood, Copdock	2·60	,,	Islay, Eallabus	7·24
,,	Blakeney	2·57	,,	Tiree, Cornaigmore	5·71
,,	Swaffham	2·20	XVI.	Dollar Academy	4·24
V.	Bishops Cannings	4·19	,,	Balquhidder, Stronvar.....	10·03
,,	Wimborne, St. John's Hill ...	6·67	,,	Glenlyon, Meggernie Castle..	10·34
,,	Ashburton, Druid House.....	8·59	,,	Blair Atholl	5·71
,,	Cullompton	3·08	,,	Coupar Angus	3·71
,,	Lynmouth, Rock House	5·46	,,	Montrose, Sunnyside Asylum.	3·28
,,	Okehampton, Oaklands... ...	5·13	XVII.	Alford, Lynturk Manse	4·57
,,	Hartland Abbey.....	3·81	,,	Fyvie Castle	4·32
,,	Probus, Lamellyn.....	5·13	,,	Keith Station	4·78
,,	North Cadbury Rectory.....	3·70	XVIII.	Rothiemurchus	6·17
VI.	Clifton, Pembroke Road.....	4·28	,,	Loch Quoich, Loan	27·20
,,	Ross, The Graig	2·88	,,	Drumnadrochit	6·48
,,	Shifnal, Hatton Grange.....	2·90	,,	Skye, Dunvegan	8·61
,,	Droitwich.....	2·14	,,	Lochmaddy, Bayhead	4·50
,,	Blockley, Upton Wold.....	3·86	,,	Glencarron Lodge	13·00
VII.	Market Overton.....	3·60	XIX.	Invershin	3·45
,,	Market Rasen	2·01	,,	Melvich	5·29
,,	Bawtry, Hesley Hall	2·12	,,	Loch Stack, Ardchullin	9·16
,,	Derby, Midland Railway.....	3·63	XX.	Skibbereen Rectory	4·57
,,	Buxton	6·44	,,	Dunmanway, The Rectory ..	5·52
VIII.	Nantwich, Dorfold Hall	3·47	,,	Glanmire, Lota Lodge.....	3·18
,,	Chatburn, Middlewood	7·40	,,	Mitchelstown Castle.....	3·98
,,	Cartmel, Flookburgh	...	,,	Darrynane Abbey.....	3·59
IX.	Langsett Moor, Up. Midhope	6·03	,,	Clonmel, Bruce Villa	2·94
,,	Scarborough, Scalby	3·92	,,	Newmarket-on-Fergus, Fenloe	4·35
,,	Ingleby Greenhow	3·61	XXI.	Laragh, Glendalough	4·64
,,	Mickleton	6·70	,,	Ballycumber, Moorock Lodge	3·87
X.	Bellingham, High Green Manor	4·70	,,	Balbriggan, Ardgillan	3·08
,,	Ilderton, Lilburn Cottage ...	4·50	XXII.	Woodlawn	5·77
,,	Keswick, The Bank.....	8·29	,,	Westport, St. Helens	5·37
XI.	Llanfrechfa Grange	5·86	,,	Dugort, Slievemore Hotel ...	8·82
,,	Treherbert, Tyn-y-waun	10·73	,,	Mohill Rectory	4·46
,,	Carmarthen, The Friary	5·80	XXIII.	Enniskillen, Portora.....	5·16
,,	Castle Malgwyn [Llechryd]...	...	,,	Dartrey [Cootehill]	4·53
,,	Crickhowell, Tal-y-maes.....	6·50	,,	Warrenpoint, Manor House ..	3·50
,,	New Radnor, Ednol	6·30	,,	Banbridge, Milltown	2·94
,,	Birmingham WW., Tyrmynydd	8·90	,,	Belfast, Cave Hill Road	5·69
,,	Lake Vyrnwy	5·71	,,	Glenarm Castle..... ...	..
,,	Llangyhanfal, Plâs Draw.....	3·26	,,	Londonderry, Creggan Res...	4·42
,,	Dolgelly, Bryntirion.....	6·35	,,	Dunfanaghy, Horn Head ...	7·09
,,	Bettws-y-Coed, Tyn-y-bryn...	7·18	,,	Killybegs	7·73

THAMES VALLEY RAINFALL. —— NOVEMBER, 1914.

Symons's Meteorological Magazine

Watershed of River Thames above Teddington, and River Lee above Feildes Wein ——

Rainfall Stations reporting ---------- ●

Isohyetals.

THE WEATHER OF NOVEMBER.

THE weather was generally mild and unsettled at the beginning of the month. A depression which moved across the south-west of England caused heavy rain over Devon and Cornwall on the 1st and over the Thames Valley on the 2nd. The fall on the 2nd amounted to 1·96 in. at Shrewton, Salisbury Plain, where heavy showers of rain and hail with some thunder and lightning lasted for about 20 hours. Many other stations in Wiltshire had more than 1·50 in. of rain, frequently accompanied by thunder. Temperature was unusually high, records above 55° in the shade occurring in all parts of the Kingdom between the 3rd and the 6th. In the south and east of England 60° was recorded generally, and in London and Margate 62°. A depression which travelled in a northerly direction from the Bay of Biscay on the 5th caused heavy rain over Ireland, the heaviest falls being in the north-east. At Belfast, where there was hail and thunder, the fall was 1·51 in. Local thunderstorms occurred in the South Midlands on the 6th. At Boxmoor, where the lightning was very vivid between 2 and 3 p.m., ·46 in. of rain fell in less than an hour. Anticyclonic conditions prevailed over the southern part of the Kingdom at the end of the first week and fair weather was experienced over England, but in Scotland and Ireland the conditions were less settled. Low pressure irregularities passing eastward across the Kingdom caused showers and frequent squalls in most districts during the second week. On the 11th, the wind force at Rousdon was 44 miles per hour from 3.30 to 4.15 p.m. More than 2·00 in. of rain fell at stations in the Lake District on the 12th. A deep depression passed across Ireland and the south of England to the Continent on the 14th and 15th causing heavy rain, with considerable falls of snow over the central and northern parts of Great Britain. About 1·50 in. of rain fell at several stations in the west of Ireland on the 14th and a similar amount in the south-east of England on the following day. At Southwell the snow was 4 inches deep and at West Witton 6¾ inches. Thunder and lightning were reported at Torquay, Ventnor and elsewhere on the south coast. An anticyclone, which increased in intensity, spread over the Kingdom on the 16th, and fair, cold weather became general. Severe frosts occurred in all districts except the south of England. At Balmoral the shade minimum on the 18th was 14°, at Kilmarnock 19°, and it was only slightly higher at many other stations in Scotland. Slight snow fell over the south-east of England on the 19th. A series of depressions passed across the Kingdom from the west during the latter days of the month and caused unsettled or rough weather generally. Heavy rain occurred along the western coasts on the 25th, the fall amounting to 1·81 in. at Inveraray, and 1·66 in. at Delphi Lodge (Co. Mayo). On the 29th more than 2 in. fell at many stations in the west of Great Britain and at Killin 3·00 in. was measured. Heavy rain fell at widely distributed stations on the last day. In the south of England it was accompanied by a strong south-west wind. Many places had 1·50 in. of rain, and at Hailsham there was 1·75 in. At Aberfeldy the River Tay was in high flood.

In London the weather was generally dull, showery and mild throughout, with fog or mist on several mornings. The mean temperature at Camden Square, 45°·1, was 1°·6 above the average. The duration of sunshine was 49·2 hours, and rainfall 58·4 hours, measuring 3·52 in. Evaporation 28 in.

The total rainfall of the month was under 3·00 in. along nearly the whole of the east coast and in the South Midland counties, and less than 2·00 in. in the Fen District. Some high level stations in South Wales and Snowdonia had more than 10 in., and in the Lake District there was an area with more than 20 in. of rain. The Western Highlands were, as usual, very wet, a large area having more than 15 in., and at Loan there was 27 in. In Ireland the amounts ranged from about 3 in. in the south-east to more than 10 in. on the high land of Co. Mayo. The total rainfall expressed as a percentage of the average was as follows: England and Wales, 133; Scotland, 133; Ireland, 124; and of the British Isles, 130.

Climatological Table for the British Empire, June, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, CamdenSquare	89°0	30	41°5	8	73°9	50°8	51°9	73	134°4	41°2	1·15	12	4·3
Malta	86·0	25	60·5	8	75·3	65·1	...	71	132·0	...	·00	0	1·1
Lagos	88·0	11	70·0	13	84·5	73·9	73·3	84	156·0	67·0	23·74	27	8·7
Cape Town	78·6	23	35·7	28	63·5	46·7	48·9	80	...	...	3·97	12	4·7
Natal, Durban ...	70·0	19	46·0	30	63·6	55·0	50·0	66	...	...	·31	3	3·5
Johannesburg	66·2	1	26·0	28	59·4	40·4	35·8	69	...	23·5	·19	1	2·2
Mauritius	81·7	7	60·6	29,30	77·4	66·1	63·6	77	...	51·1	5·14	15	5·4
Bloemfontein	66·4	7	26·6	28	58·6	34·5	32·6	73	...	...	·23	2	3·6
Calcutta...	97·6	4	74·3	17	91·3	78·7	77·0	81	...	72·1	9·27	12	6·8
Bombay...	93·7	6	76·4	22	89·5	80·7	78·0	80	138·0	67·6	16·69	25	6·6
Madras	110·3	1	76·0	14	101·7	82·3	71·0	61	165·6	74·2	·64	8	4·9
Colombo, Ceylon ...	88·1	11	73·2	20	86·3	76·9	75·5	82	160·0	71·2	10·27	26	7·8
Hongkong	89·9	30	75·1	1	86·6	78·9	74·8	79	...	...	12·23	17	7·4
Sydney	66·2	7,29	44·1	13	62·2	49·3	46·3	78	119·9	34·9	5·01	21	5·2
Melbourne	64·9	6	36·7	9	58·6	44·4	43·4	72	112·0	30·2	1·56	12	6·2
Adelaide	73·4	27	39·2	*3	63·8	45·9	44·9	71	122·0	27·2	·65	8	4·7
Perth	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie	71·4	2	34·8	28	65·1	42·5	38·4	50	135·0	27·4	·32	5	2·7
Hobart, Tasmania ..	62·7	12	33·1	28	54·9	42·3	39·6	68	109·3	26·0	·33	13	5·4
Wellington	60·0	1,10	33·8	29	54·6	42·5	42·2	79	109·4	26·0	3·84	15	7·0
Auckland	63·0	1, 2	39·5	28	56·2	46·4	45·6	82	121·0	35·0	3·32	22	5·7
Jamaica, Kingston ..	92·6	26	70·1	9	90·3	73·7	70·3	73	...	...	·60	6	3·2
Grenada	86·0	3,10	72·0	30	83·7	75·1	...	76	136·0	...	6·85	22	6·0
Toronto	91·3	24	38·0	20	74·9	54·0	49·0	63	107·5	35·0	2·17	11	...
Fredericton	88·0	24	26·8	4	69·1	44·7	...	66	...	...	4·49	12	5·0
St. John, N.B. ...	81·3	11	35·7	9	62·1	47·2	44·0	70	...	...	4·86	14	5·3
Alberta, Edmonton ...	87·1	2	39·0	9	68·6	48·5	...	71	137·5	36·2	8·43	17	6·6
Victoria, B.C.	78·0	14	42·5	4	62·7	49·1	50·0	76	...	...	1·67	6	4·3

*16 and 23.

Johannesburg.—Bright sunshine 279·8 hours.

Mauritius.—Mean temp. of air 2°·5, dew point 2°·6, and R 2·57 in., above averages. Mean hourly velocity of wind 11·4 miles.

COLOMBO, CEYLON.—Mean temp. of air 81°·6 or 0°·1 below, and R 2·03 in. above, averages. Mean hourly velocity of wind 6·2 miles. TSS on 4 days.

HONGKONG.—Mean temp. of air 82°·0, mean hourly velocity of wind 10·8 miles. Bright sunshine 174·4 hours.

Melbourne.—Mean temp. of air 1°·2 above, and R ·44 in. below, averages.

Adelaide.—Mean temp. of air 1°·5 above, and R 2·41 in. below, averages.

Coolgardie.—Temp. of air 1°·4 above, and R nearly one inch below, averages.

Hobart.—Mean temp. of air 1°·8 above, and R 1°·87 in. below, averages.

Wellington.—Mean temp. of air 48°·5 or 0°·9 below, average. Bright sunshine 96·3 hours. Frost on 11 days.

ALBERTA, EDMONTON. Rainfall more than double the mean for any month in Edmonton for the past 35 years except 11·88 in. in July, 1901. TSS on 5 days.

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THE RAINFALL OF 1914.

At the time of writing about 3500 complete records of rainfall during 1914 have reached the office of the British Rainfall Organization, and although it will be several months before these, and about 2000 other records which it is hoped will yet come in, can be checked and examined, it is possible already to give a brief account of the principal features of the year's rainfall.

The noteworthy features of the monthly rainfall were the prevailing wetness of the four months February, March, November, and December. Of these February was wettest in Ireland and December in Great Britain. The rainfall of December was exceptional in all parts of the Kingdom, but especially so in the south of England, where it was probably unprecedented in this respect. The map showing the distribution of rainfall in the Thames Valley, facing page 223, includes the most interesting part of the country in respect of the abnormal rainfall of this month. Of the remaining months, January was everywhere dry, and following an unusually dry December, gave a character to the mid-winter season of 1913-14 greatly in contrast with that exhibited up to the present by the same period of 1914-15. From April to October the rainfall was in general well below the average, though local thunderstorms in England brought the general fall of July slightly above the average, whilst that of August was above the average in Ireland for a similar reason. The persistent dryness of the seven months, and in particular the small rainfall of October, which was the driest month of the year, was probably as abnormal as was the great rainfall of December. It is worthy of remark that in the 57 years' observations at Camden Square the periods December 1913-January, 1914, and April-October, 1914, were both unexampled for low rainfall, whilst March and December each had a fall in excess of any previous month of the same name.

The general rainfall of 1914 as a whole may be compared with the average by means of the following values based upon 139 well distributed stations.

General Rainfall of 1914 as a percentage of the average.

England, South.	Wales.	England, North.	England and Wales.	Scotland.	Ireland.	British Isles.
112	112	103	109	103	105	106

The most notable departures from the average occurred in the south-west of England, where a considerable area extending from Plymouth into Sussex had an excess of more than 20 per cent., culminating in more than 30 per cent. in Dorset. More than 20 per cent. was also found in small areas in South and North Wales, on the coast of Clare and in northern Perthshire. The whole of the south of England, the interior of Wales, and large areas in the west of Ireland and of Scotland had more than 10 per cent. excess, and the average was exceeded over practically all western districts. The east coasts of Ireland and of Great Britain had, however, for the most part, deficient rainfall, and this was most marked in Berwickshire and in east of England between the Humber and the Wash, where a few stations had less than 90 per cent. of the average. Deficient rainfall on the east coast and an excessive fall in the south of England have formed features of the annual rainfall during each of the last four years, and the persistence of this type of distribution seems to call for further study.

TEMPERATURE OF 1914 IN LONDON.

The most interesting feature of the temperature results shown in the following table is the persistent mildness of the year, January being the only month in which the mean temperature did not exceed the average. February, with a mean temperature 4°·8 above the average was relatively the warmest month, this being mainly due to the high maximum readings of the month. The mean maximum, 51°·1, was 5°·6 above the average, and only in 1869, when it was 51°·7, has February had a higher mean maximum temperature in the past 57 years. The mean temperature of March, though 2°·1 above the average, was actually lower than that of February. In April the mean temperature exceeded the average by 3°·7, and this was again due to the generally high maximum temperatures. There are only four other instances in the 57 years' record when the average shade maximum has been higher in April. Though the summer months were generally warm, there were few days of great heat; 80° was reached on two days in May, seven in June, six in July, five in August, and two in September. Only once was 90° reached, viz., on July 1st, when temperature rose to 93°·7, the highest reading since the record high temperature of 97°·1 on August 9th, 1911. In the last eight months of the year the mean temperature, though always above the average, never exceeded it by so much as 2°, except in December, when the excess was 2°·7. The succession of eleven consecutive months with mean

temperature above the average has only once been exceeded, viz., in the thirteen months May, 1911, to July, 1912. The mean temperature of the year, 51°·8, is the highest in the record, except in 1868 and 1911, when it was 52°·3 and 52°·2 respectively.

Temperature at Camden Square in 1914.

	MEAN.		MEAN MAXIMUM.		MEAN MINIMUM.	
1914	1914	Difference from Aver.	1914	Difference from Aver.	1914	Difference from Aver.
January...	38°·2	—0°·3	42°·4	—0°·9	33°·7	—0°·1
February	44·5	+4·8	51·1	+5·6	38·5	+3·8
March.....	44·2	+2·1	51·1	+1·1	37·9	+2·5
April	51·8	+3·7	62·6	+4·7	41·6	+1·9
May	55·2	+1·2	65·5	+0·9	45·4	+0·8
June	61·7	+1·6	73·9	+3·1	50·8	+0·1
July.....	64·4	+0·9	74·6	+0·2	55·6	+1·4
August ...	64·2	+1·9	75·5	+2·8	54·7	+1·3
September	57·9	+0·2	69·6	+2·2	48·7	0·0
October ...	52·0	+1·9	59·6	+1·9	45·7	+2·0
November	45·1	+1·6	51·0	+1·9	39·9	+1·7
December	42·4	+2·7	47·0	+2·7	37·6	+2·6
YEAR ...	51·8	+1·8	60·3	+2·2	44·2	+1·5

WHAT DO WE MEAN BY THE SEASONS?

By L. C. W. BONACINA.

THE subject raised by Mr. Brodie in his letter on the seasonal limits, in the November number, is one to which I have given much thought, and on which I have written somewhat extensively in this Magazine and elsewhere.

The conventional grouping of winter months into December, January and February, and so on (as authorized by the International Meteorological Committee), is a system based exclusively on the mean temperature of the air, such as it obtains in most temperate land-areas, and though doubtless convenient for some purposes, is painfully lop-sided with respect to the solstices, and fails signally to take account of various other meteorological and astronomical relations which should unquestionably warrant the usurpation of August's place by May in the *three* summer months, and of February's by November in the *three* months of winter. Summer surely is that quarter of the year when the amount of direct light and heat received by the earth over the entire Northern Hemisphere between the Tropic of Cancer and the Pole, is greatest; that is to say it embraces the period May 8th to August 7th, or approximately the months of May, June, and July. The air temperature, of course, is high, especially in July, but that is only incidental to the long days and high sun. Similarly, winter is the opposite quarter, when the sun, being lowest in the heavens, and the days shortest,

the minimum amount of direct radiation is received by the earth; that is, it comprises the period November 8th to February 7th, or approximately the months of November, December, and January. It so happens, however, that in consequence of a well-known physical effect, a temperature lag takes place, whereby the times of maximum and minimum soil and air temperature occur after the midsummer and midwinter months (June and December), respectively, and are continued into the early autumn and spring. But this simply means that, by reason of accumulated heat, autumn is a warm season, though the temperature is falling, and spring, by reason of accumulated cold (if it is permissible to speak so of negative quantity), a cold season, though the temperature is rising. And it is, after all, the amount of direct light and heat, even more than the temperature of the air, to which the periodic changes of plant and animal life most closely correspond, as every observant countryman knows. In August and September very high temperatures often occur in favourable types of weather, but the quality of the heat and the character of light and shade are already autumnal; nor is there the same tendency in the latter part of August for the sudden development of those violent thunderstorms which are such a feature in May—when the sun already strikes with a shaft-like power, apparent even on days when the air is cool. Similarly, bitterly cold as February and March often are, the true darkness of mid-winter can never be simulated, and when, as is common enough, severe weather prevails at the end of November, the meaning of winter is brought out in a far more formidable and vivid manner than when similar weather accompanies the lengthening equinoctial days and steeper sun-light at the end of February. There can, I think, be no question but that the height of the sun in the heavens should out-weigh every other consideration in our arrangement of the seasons, and that summer and winter should signify the solstitial periods, spring and autumn the equinoctial. On a cool or cold day in June one is aware that the sun has but to burst the clouds, and the air may become hot in an hour, even as late as 6 p.m. That is the true height of summer. But in late August and September the sun cannot subvert a generally cool type of conditions in the same way, and for very high temperatures to occur in autumn a favourable combination of factors is required. Again, although the month of February in England has a mean air temperature a trifle below that of December, there occasionally occur in February bursts of true spring weather, with warm sunshine, such as are physically impossible in the depth of winter, however mild the weather may be. This clearly stamps February as a spring or equinoctial month, and shows that it is illogical on the ground of average air temperature to place the month in the same category with December and January.

WEATHER IN THE SEVENTEENTH CENTURY (LAST QUARTER).

By Walter Sedgwick.

Part III.—Winter.

In the two previous articles of this series the weather during the spring, summer. and early autumn has been considered; *i.e.* from March 26th (the beginning of the year under the Julian Calendar) to October 21st O.S., or, reckoning by the Gregorian Calendar, from April 6th to October 31st. The remainder of the year, roughly five months, is dealt with in this article. It will probably be remembered that these articles are based upon the information given in the Diary, or Rector's Book, kept from 1672 to 1701, by the Rev. William Sampson, Rector of Clayworth, Notts, and sometime President of Pembroke College, Cambridge.

The chief interest of the weather notes of the Rector, which are considered in this article, are those relating to mid-winter, as they throw some light on two controversial questions, viz., (1) Are the winters in England tending to grow milder? and (2) Was snow and hard frost really characteristic of the weather at Christmas time two or three centuries ago?

Before, however, dealing with the weather of Christmas and mid-winter, it is desirable to refer briefly to the weather of November and early winter. As regards November, Mr. Sampson has not given much information. The weather of the month is mentioned in eight years, and it appears that the month was then as now, a wet one. In six years frost or snow is stated to have occurred, and in one year (1700) snow is recorded on five separate days, and even as early as the 3rd, 4th and 5th. In the following year (1701) there was a very mild spell from the 23rd to 25th. There is no account of any prolonged spell of cold, nor even of a spell as cold as that which occurred in London last November, unless it be in 1697, when a frost set in, which, it is stated, brought on a long and sharp winter. This frost was succeeded by extensive floods in December, just as in this winter the cold of November was followed by excessive rains in December.

The weather between November 21st and December 11th O.S. (December 1st to 21st N.S.), is mentioned in eleven years, and on the whole seems to have been very similar to that now experienced during the same period of the year. In only three years is there a reference to a spell of frost, viz., in 1696, from the 12th to 23rd N.S., in 1699, up to the 5th, N.S., and in 1700, from the 12th to 18th, N.S., while there are references to mild or open weather in five years, viz., 1679, 1693, 1695, 1699, and 1700, and to floods in two others, viz., 1696 and 1697.

The next week, December 12th to 18th O.S., corresponds, relatively to the position of the earth in its orbit, to Christmas

week (December 22nd to 28th) of the present time. It is impossible to say from the information given about this week, whether it was more often a cold week or the reverse, but it is clear that it was not always accompanied by frost and snow. The one reference to the day which actually corresponds with the present Christmas Day, is in 1700, when there was "mild weather." In 1683 the week was a very cold one and probably too in 1695 and 1696; on the other hand in 1693 and 1699 it is almost certain that there was no pronounced cold weather.

If, however, the popular conception of "old-fashioned" Christmas weather has come down to us from the Seventeenth Century, it is necessary to consider the observation relating to December 22nd to 28th O.S. (January 1st to 7th N.S.). In one year only (1701), has Mr. Sampson described the weather on Christmas Day (O.S.) itself, and that was a "sore wet day," and was followed by a gale in the night. As regards other years the information given is as follows :—"1681, After Christmas fell abundance of rain; 1683, Very severe frost; 1689, A snowstorm on the 22nd; 1691, Frost set in on the 28th; 1692, Very wet from the 27th to 31st; 1693, Open weather (probably); 1698, Very windy on the 22nd." These records are not numerous, but, as far as they go, they do not bear out the popular idea about Christmas-tide weather, nor do they show that Christmas week during Mr. Sampson's life was accompanied by severe weather, more often than the first week of January at the present time, with which the former week corresponds.

In January, or mid-winter, there are three years marked by very severe weather, viz., 1684, 1692, and 1698; also in 1695 and 1699 the month was probably a cold one. In the other years when information is given, the month seems to have been an unsettled one, and to have been characterised in 1680, 1700, and 1702, by windy or stormy weather.

Taking the winters as a whole the outstanding meteorological event was the very severe frost of 1683-4, the winter of "Frost-Fair" on the Thames. Mr. Sampson's observations are an interesting supplement to the fuller particulars given by John Evelyn, and bear out his evidence of a frost more severe even than that of January-February, 1895, and of any other frost in the lifetime of the present generation. The only other prolonged frost mentioned by the Rector is that of the winter of 1691-2, the severity of which is not borne out by John Evelyn. One other winter was apparently very cold, *i.e.*, 1697-8. For the rest the Diary points to occasional short spells or days of frost or snow, varied by spells or days of rain, high winds or open weather, not unlike the majority of the winters of the present time. It is not possible to speak positively on the somewhat scanty records given by the Rector, but it is at any rate difficult to assert, when the winters of 1879-80,

1880-81, 1890-1, and 1894-5 are re-called to mind, that these records demonstrate that the winters during his residence at Clayworth Vicarage were on the whole more severe (even after allowing for the bitter frost of 1683-4), than the winters exactly two centuries later, *i.e.*, from 1879-80 to 1901-2. There are, however, no records in this Diary of great warmth, which bear comparison with the statement of Pepys on January 31st, 1661, "The ways are dusty and the flies fly up and down, and the rose bushes are full of leaves," or of Evelyn on January 25th, 1662, "Near as warm as at Midsummer in some years." This may be accounted for by the more northerly and colder situation of Clayworth than London.

Before closing these notes, attention is directed to the frequent occurrence of snow and cold weather towards the end of the year, *i.e.*, Lady Day O.S., or April 4th N.S. For instance: "1687, In the end of the year, snow; 1693, March 8th to 10th, 15th, 16th, and 27th, snow; 1694, March 14th, snow; 1695, March 10th, 11th, and 12th snow; 1696, March 10th to 18th, snow, hail and frost, 26th, extreme cold, 27th, deep snow, and 30th, snow all the afternoon; 1697, March 28th, snow; 1698, snowy piercing weather up to Lady and May Day (O.S.); 1699, March snowy; 1701, March 3rd, 6th, and 7th, snow, 31st, sleet; April 1st, a great snow all day and so on to the 4th; 1702, March 11th, wind, rain and snow.

NOTE.—In the following extracts the dates both in the margin and text have been corrected to New Style, except in cases under the heading "Seasons." In these cases it has been found more convenient not to alter the language of the Diary, but where possible the corrected dates in New Style are given in brackets.

Dates. New Style.

1679-80. December 2nd, a very warm season.
January 27th, strong winds this last fortnight.

1681-2. *Seasons.*—After Christmas (January 4th) fell abundance of rain.

1683-4. *Seasons.*—Upon St. Lucy, December 13th (23rd), it began to freeze and continued until the 10th (20th) January; then thawed; on the 14th (24th) day the frost returned: on the 20th (30th) it gave a little, but putting in a fresh the next day continued most violent till the 5th (15th) February, when it began to thaw for all together. From the beginning to the end of it were 52 days. It dried up ponds and rivers and most springs and caused a very great drought. Bread and drink; meats and fruits were almost converted into ice. The hardiest plants felt its force and the perennial more than the annual. Rosemary, sage, fenil, artichokes, etc., were generally killed throughout the country. And upon the thaw Nottingham and Muskham bridges were broken down with ice.

1685-6.		*Seasons.*—A dry February.
1686-7.		*Seasons.*—In the end of the year (*i.e.* March 25th O.S.) snow.
1688-9.	March	10th and 11th, winds that did much hurt to houses, etc.
1689-90.	January	1st, snow above a foot deep on the plain ground, but blown in ricks in divers places as high as ordinary pales; we were fain to have our way cut from the court to the church, and it was as high as our heads on both sides.
1691-2.	January	7th to February 23rd. A sore frost; as long as the famous great frost in 1683, though not as severe.
1692-3.	November	11th, snow; 25th and 26th, frost, snow and wind.
	December	19th, extraordinary stormy winds and rains.
	January	6th to 10th, very wet; 17th, frost puts in; and again on the 25th.
	February	5th, in the night a mighty wind; 23rd, a sharp storm of snow.
	March	8th to 10th, so again (*i.e.* snow); 15th and 16th, snow and high winds; 27th much snow.
1693-4.		*Seasons.*—December, open weather.
	January	19th, snowy, frosty and windy.
	February	14th, high winds.
	March	2nd, rain after long drought; 14th, sharp wind with snow; 23rd, store of rain after a dry season.
1694-5.	December	19th, foggy weather.
	January	11th, it freezes; 15th, thaws; 20th, frost returns with snow.
	February	10th, it began to thaw; 22nd, snow.
	March	10th, 11th, and 12th, snowy again; 22nd, at evening it took to raining. The length of the winter caused a scarcity of fodder.
1695-6.	November	18th, calm the three weeks past; 26th, a wind in the night after a long calm.
	December	15th, calm and mild weather; 16th, a slap of rain; 24th, a very sore snowy day; 26th, a frost.
	January	15th, fine and open.
	February	5th, a very sore snowy morning.
	March	5th, a sharp wind; 10th this month hitherto (*i.e.* since 10th), has been snow, hail, and frost; 23rd, hail and storm after noon; 26th, extreme cold; 27th, a good deep snow; 30th, it snowed all the afternoon.
	April	2nd, a glorious day after much ill weather.
1696-7.	November	20th, stormy rains.
	December	8th, the earth almost swims with water; 12th, freezes sharply to the 23rd; 28th, frost continues to the 1st January.
	February	3rd, a great snow; 9th, a thaw; 13th, snowy and so the 15th, 16th, and 17th; 20th, frost holds on; 22nd, it thaws.
	March	3rd, Fine fair weather enters; 16th, very windy for two

or three days; 28th, this morning (after 2 or 3 days N. wind), fell a snow at least 3 inches deep.

1697-8. *Seasons.*—In November frosts set in and bring on a long and sharp winter. In December waters are so much out as that the Trent overflowing ran against the upper part of trees growing on Saundly Marsh-bank, nigh Gainsborough, and cut some of the trees off in middle over Thwart. In January was frosty and snowy piercing weather up to Lady and May day following.

A long winter made fodder in the spring dear.

1698-9. *Seasons.*—November, rains and frosts by turns. December 1st (11th) snowy; the 22nd (January 1st), very high winds; January snowy and frosty; February, windy; March snowy.

1699-1700. *Seasons.*—November, entrance is rainy, later end snowy; December, begins with frost about 5th (15th) open weather and so all the month; January, 12th to 21st (22nd to 31st), great winds; March, 10th to 19th (21st to 30th), a sharp east wind.

1700-1. November 3rd, 4th, and 5th, snowy; 25th and 26th, snowy and rainy.

December 8th, mild weather; 12th, frost begins and continues to the 18th; 25th, mild weather.

January 20th, thaw; 25th and 26th, a great snow; 28th, a swift thaw; 31st, a great sop of wet on the ground.

February 2nd, rains continue; 9th, gentle thaw; 19th and 22nd, snow with sharp winds.

March 3rd, 6th, and 7th, snow with sharp wind; 9th, frosty; 25th, wet; 30th, sharp winds from N.E. most of this month (O.S.); 31st, sleet of snow.

April 1st, a great snow all day and so on to the 4th.

1701-2. November 3rd, mizzling; 4th, 5th, and 6th, rain; 9th, frost; 23rd, 24th, and 25th, very mild weather.

Seasons.—Christmas Day (January 5th), a sore wet day, and towards the evening and in the night so high a wind, as not only private houses, but divers churches in several counties were much damaged by it. January 9th (20th), very wet and windy to the end of the month; February 1st, (12th) the winds follow us into this month.

February 16th, snowy; 19th, frosty; 21st, rainy; 27th and 28th, high west wind with a driving snow.

March 1st, hard frost; 2nd and 3rd, high west winds again; 6th frosty; 11th, wind, rain, and snow; 18th to 29th, fair and calm without wind or rain; 30th and 31st, sharp east wind.

April 4th, a shower after a month's drought.

ROYAL METEOROLOGICAL SOCIETY.

A GENERAL Meeting of the Royal Meteorological Society was held on December 16th, at the Surveyors' Institution, Westminster, Dr. H. N. Dickson in the Chair.

Mr. W. F. Stacey read a paper on "The Distribution of Relative Humidity in England and Wales." The purpose of Mr. Stacey's investigation was mainly to test the trustworthiness of humidity data. A series of maps were prepared from the records of 91 stations, showing the distribution of mean relative humidity at 9 a.m., during the period 1901-1910, for the twelve months and the year, and also the annual range of monthly means during the same period. The records appeared, by their consistency, to justify the following general conclusions :

(1.) In winter the air over the interior of the country is more moist than that over the coastal regions.

(2.) Minimum relative humidity occurs earlier in the year in the western parts of the country than in the eastern.

(3.) In summer the air over the interior of the country is drier than that over the coastal regions.

(4.) The smallest range of humidity is found in the west; the greatest in the interior towards the east.

No indication appeared of any direct connection between relative humidity and rainfall, but there was evidence of the close relation of the former with temperature. The regions of small and great range of humidity corresponded closely with those of small and great range of temperature.

Dr. Shaw, whilst commenting on the neglect, hitherto, of this important element, and the small progress made in its study, expressed his indebtedness to Mr. Stacey for his paper, and the interest which it aroused. He drew attention to the unfortunate choice of the hour of observation and produced diagrams showing not only the extreme rapidity of the variation at 9 a.m., but the great daily range compared with the small differences between the mean values at the various stations.

Mr. Salter suggested that some of the difficulties introduced by the hour of observation might be eliminated by the study of absolute humidity rather than relative humidity.

Mr. Dover gave some interesting explanations for local variations, which he based on 25 years of observations. He considered the subsidiary maximum observed in June to be the effect of the rapid advance in vegetation, especially grass, from May to June, when late mists and dew resulted. The subsequent cropping of the grass might produce the second minimum in July.

Mr. Marriott exhibited a series of diagrams showing the relation of humidity to other elements at a selection of stations.

Mr. Bryant and Mr. Strachan also spoke.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

VISIBILITY AND THUNDERSTORMS.

THE discussion of these matters in your paper makes the following quotations from "The Voyage of the *Beagle*" appropriate. On page 4, writing of the Cape de Verd Islands, Darwin says :—

"One morning the view was singularly clear; the distant mountains being projected with the sharpest outline, on a heavy bank of dark blue clouds. Judging from the appearance, and from similar cases in England, I supposed that the air was saturated with moisture. The fact, however, turned out quite the contrary. The hygrometer gave a difference of 29·6°, between the temperature of the air and the point at which dew was precipitated. This difference was nearly double that which I had observed on previous mornings. This unusual degree of atmospheric dryness was accompanied by continual flashes of lightning. Is it not an uncommon case, thus to find a remarkable degree of aerial transparency with such a state of weather ?"

In Chapter III., page 61, he alludes to another matter which has been under discussion in these pages—the varying destructiveness of lightning in different regions. After a description of fulgurites found in the neighbourhood, he continues :—

"The neighbourhood of the Rio Plata seems particularly subject to electric phenomena. In the year 1793 one of the most destructive thunderstorms, perhaps, on record, happened at Buenos Ayres; thirty-seven places within the city were struck by lightning, and nineteen people killed. From facts stated in several books of travels, I am inclined to suspect that thunderstorms are very common near the mouths of great rivers. Is it not possible that the mixture of large bodies of fresh and salt water may disturb the electrical equilibrium ? Even during our occasional visits to this part of South America, we heard of a ship, two churches, and a house having been struck."

AGNES FRY.

Failand House, nr. Bristol, 7th December, 1914.

A REMARKABLE SERIES OF DRY YEARS.

THE November Magazine contained a letter describing the effects of the drought of August and September in South Cambridgeshire. Here too, we suffered considerably from want of water, which was due to a long series of years with deficient rainfall.

It occurred to me to examine the figures for the Marchmont station, which has a long record, as published in *British Rainfall*. The result was sufficiently interesting for publication. During the period 1896-1913, every year, except four, had a deficient rainfall, the average being taken for the period 1875-1909, and amounting to 33·76 in. The total shortage of rainfall from January, 1896, to the end of October, 1914, was 53·37 in., or more than one and a half times the average rainfall for one year.

Swinton House, Berwickshire. A. E. SWINTON.

THE FROSTS OF SEDGMOOR.

FROM the physical topography of its surroundings, as well as from the marshy character of the surface of this veritable bit of the Fen-country in mid-Somerset, it has always struck me that the historic vale of Sedgmoor must be liable to peculiarly severe frosts —both raw and bitter: and my impressions were confirmed whilst traversing the district on a Great Western express soon after 2 p.m. on December 24th last. On this occasion Sedgmoor was one vast frozen lake after the heavy rains, with the willow heads just above the surface of the ice, and shrouded in a steely-blue frosty fog, on which the low December sun-beams glanced idly, forming a wintry picture of the most fascinating character. We thus have in Somersetshire two great "moors," each possessing from different causes, a severe winter climate, viz., Exmoor, with its bleak winds and heavy snows, the highest ground in the county, and Sedgmoor, the lowest ground in the county, or nearly so, the receptacle into which the cold air from the various surrounding hill-ranges sinks and stagnates.

L. C. W. BONACINA.

Hampstead, N.W., 2nd January, 1915.

HEAVY RAINFALL AT HASLEMERE.

THERE has been unusually heavy rain in this district, as the following figures will show. The average of 22 years is: for the year, 35·57 in. (1914, 44·91 in.); for November, 3·48 in. (1914, 5·17 in.); for December, 3·87 in. (1914, 11·96 in.).

From November 24th to December 15th there was a rain spell of twenty-two days, yielding 10·01 in.; during this time there fell on November 30th, 1·11 in.; December 9th, 2·10 in.; December 12th, 1·00 in.; December 13th, 1·23 in.

During the forty-one days from November 24th to January 3rd, I give the following particulars:—

Nov.	24—30,	1914	...	7 days	...	2·83 in.
Dec.	1—31,	,,	...	31 ,,	...	11·96 ,,
Jan.	1—3,	1915	...	3 ,,	...	1·84 ,,
				41 days.		16·63 in.

Other wet periods may be noted in comparison:—

	in.		in.		in.			in.
1882—Oct.,	8·16;	Nov.,	4·13;	Dec.,	4·13	Three months,		16·42
	(Mr. J. M. Penfold, Courts Hill, Haslemere).							
1891—Oct.,	8·84;	Nov.,	4·83;	Dec.,	5·19	,,	,,	18·86
1911—Oct.,	5·65;	Nov.,	5·48;	Dec.,	10·65	,,	,,	21·78
1914—Oct.,	2·30;	Nov.,	5·17;	Dec.,	11·96	,,	,,	19·43

THOMAS P. NEWMAN.

Hazelhurst, Haslemere Surrey.

REVIEWS.

Report on the Administration of the Meteorological Department of the Government of India, in 1913-14. By Dr. G. T. Walker, C.S.I., F.R.S. Simla, 1914. Size 13 × 8. Pp. 14, 1 plate.

The Report gives a brief account of the existing arrangements for carrying out the work of the various departments of the Indian Weather Service, of the number of inspections made and new work projected, during the year. The general character of the work of the Observatories was satisfactory. Rainfall records were received in all from 2826 stations.

The activities of the service fall naturally under two heads, the directly useful and the scientific, or indirectly useful. Among the former may be mentioned the scheme for the re-organization of the storm-warning service, which has been submitted to the Government, and the extension of the use of wireless telegraphy in collecting ocean observations. It has also been found possible to apply better statistical methods to the investigation of monsoon forecasting, and these promise to lead to useful results. The special programme of upper air research undertaken in 1912 by Mr. J. H. Field, has, unfortunately, been hampered by delay in the construction of the Observatory, but pilot balloon work has been carried on.

The expansion of the work of the Office during the past decade is well shown in the form of a diagram. It is interesting to note that whilst in nearly every department the output has increased three or four-fold in that period, the total cost of the administration has remained practically stationary.

These short and simple annals of the Indian Meteorological Department do not entirely conceal the human element behind the official formality of their language, and those who are familiar with observational work may read much between the lines of the coldly tabulated statistics of "mistakes" on the part of Observers detected at headquarters. They may also read something of the constant supervision and watchfulness which are exercised to ensure the accuracy of the great masses of data published. C.S.

La Nebulosità in Italia [*Amount of Cloud in Italy*]; [From Annali del Ufficio Centrale di Meteorologia e Geodinamica, Vol. **35,** Part I., 1913]. By F. Eredia. Rome, 1914. Size 13 × 9½. Pp. 38.

Dr. Eredia deals with the cloud values for about 130 stations in Italy, and discusses the means for 10-day periods, the months, the seasons, and the year, the last three in comparison with Friedemann's results (Archiv. der deutchen Seewarte, 1913). The

monthly means are expressed in the form of sectional diagrams, showing the variations in seasonal march in relation to distance from the sea and to station elevation. Maps of the average distribution during the four seasons and during the year, and of the range between the most cloudy and least cloudy months are also given. The winter is the period of maximum cloud, the greatest amounts being recorded on the shores of the Adriatic. In summer the greatest amount of cloud is found, as might be expected, over the Alps, and during the year as a whole, the effect of land relief is strongly marked, the districts with more than 50 per cent. being closely coincident with the uplands. The range is greatest in Sicily, where December has between 60 and 70 per cent. of cloud, and July less than 20 per cent. The range diminishes with elevation, and is less than 20 per cent. in the Alps.

INTERNATIONAL BALLOON ASCENTS.

By W. H. Dines, F.R.S.

November 11th, 1911.

Starting Point.	Country.	A (H_c.) miles.	B (T_c.) ° F.	C miles.	D ° F.	E miles	F
Limerick.....	Ireland....	4·9	—63	8·9	—63	30	S.E. by S.
Manchester.....	England ..	4·7	—50	13·5	—46	45	E.N.E.
Brussels	Belgium ..	6·7	—72	15·0 ?	—60	120	N.E. by E.
Paris.....	France ...	6·1	—71	10·6	—66	144	N.E.
Munich	Germany..	..	..	6·9	—81	50	N.E. by E.
St. Petersburg ..	Russia	6·3	—81	10·2	—65	69	E.S.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On this occasion two of the Continental balloons were not found, an unusual occurrence, and two of the instruments failed to register. The balloon sent up from Pyrton Hill burst prematurely at less than three miles height.

An extensive anti-cyclone lay over eastern Europe and a high pressure on Spain. Between these a low pressure area stretched from the Western Mediterranean to Iceland.

There are unusually large differences in the values both of H^c and of the temperatures, which is partly accounted for by the pressure distribution.

SCOTTISH METEOROLOGICAL SOCIETY.

THE Annual Business and General Meeting of the Society was held on 14th December, 1914, in the Goold Hall, Edinburgh, Mr. J. Mackay Bernard, President, in the Chair.

The Report from the Council referred to the great loss the Society had sustained through the deaths of Sir John Murray and Dr. R. T. Omond; to the fact that, under the arrangements recently arrived at with the Meteorological Committee, the Scottish area was now for the first time effectively represented in the Monthly Weather Report, whilst a more extensive system of inspection of stations had become possible; and to the Meteorological Conference which was to have been held in Edinburgh last September.

Dr. W. N. Shaw moved the adoption of the Report, and the following Council and Office-bearers were elected for the ensuing twelve months :—

President, J. Mackay Bernard; *Vice-Presidents*, Prof. R. A. Sampson, D.Sc., F.R.S., and C. T. R. Wilson, F.R.S.; *Council*, Prof. A. Crum Brown, M.D., LL.D., F.R.S., J. R. Milne, D.Sc., T. S. Muir, C. G. Knott, D.Sc., James Watt, W.S., A. Crichton Mitchell, D.Sc., Sir R. P. Wright, Prof. T. Hudson Beare, and J. D. Falconer, D.Sc.; *Hon. Secretary*, E. M. Wedderburn, D.Sc., W.S.,; *Hon. Treasurer*, W. B. Wilson, W.S.

Mr. R. W. Wrigley, B.A., Assistant Astronomer, The Royal Observatory, Edinburgh, read a paper on "The Deep Rock Thermometers of the Calton Hill." An old series of observations from 1837-1876 had formed the basis of classic researches by Professor James D. Forbes amd Lord Kelvin, regarding the rate of conduction of heat through the rock. A new set of four thermometers was installed in 1880, the largest with its bulb 21 feet below the ground, and at that depth the highest temperature for the year occurred early in December, and the lowest early in June, whilst the average annual range was less than 2° F. The annual mean temperature for each thermometer showed many and notable fluctuations from year to year. As these fluctuations were always first visible on the shallower instruments and transmitted later to the deeper ones, it was demonstrated that the fluctuations did not arise from variations in the flow of heat from the earth's interior, but were due to external sources. A search for periodic variations had not been crowned with decided success, though there appeared to be evidences of a mean period equal to that of the sunspots, 11·13 years. This sunspot period had been found by Köppen and Newcomb to exist in air temperatures but the amplitude was too small to be important. Dr. Shaw, Professor Sampson, Dr. Knott, and the President took part in an interesting discussion, and Mr. Wrigley was cordially thanked for his paper.

RAINFALL TABLE FOR DECEMBER, 1914.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1914. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·13	6·34
Tenterden	*Kent*	51 4	*0 41	190	2·77	7·15
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·91	9·71
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	3·23	9·37
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·06	5·01
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·13	...
Shoeburyness	*Essex*	51 31	*0 48	13	1·71	4·08
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·14	5·93
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·07	5·51
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·46	10·58
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·68	7·43
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·71	6·59
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·99	6·86
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·66	5·38
Boston	*Lincolnshire*	52 58	0 1	11	1·88	4·48
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·17	4·07
Macclesfield	*Cheshire*	53 15	2 7	501	3·35	5·64
Southport (Hesketh Park)	*Lancashire*	53 39	2 59	38	3·10	5·10
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·75	10·42
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·27	4·76
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·32	4·64
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·46	3·90
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	15·14	18·44
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·70	8·19
Haverfordwest	*Pembroke*	51 48	4 58	90	5·18	9·61
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·66	9·57
Llandudno	*Carnarvon*	53 20	3 50	72	2·84	6·64
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·84	8·58
Marchmont House	*Berwick*	55 44	2 24	498	2·83	5·30
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·48	9·18
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·95	5·61
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	8·57	9·67
Mull (Quinish)	,,	56 34	6 13	35	6·59	9·08
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·67	4·42
Braemar	*Aberdeen*	57 0	3 24	1114	3·13	8·81
Aberdeen (Cranford)	,,	57 8	2 7	120	3·43	5·58
Cawdor	*Nairn*	57 31	3 57	250	2·53	...
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·62	7·57
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·86	13·84
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·09	5·00
Wick	*Caithness*	58 26	3 6	77	3·11	3·28
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·92	13·17
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·32	9·64
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	4·34	6·10
Ennistymon House	*Clare*	52 57	9 18	37	5·03	9·30
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·42	8·58
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·41	7·52
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·27	6·19
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·39	7·21
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	6·11	8·75
Cong (The Glebe)	,,	53 33	9 16	112	5·42	9·28
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·34	6·91
Seaforde	*Down*	54 19	5 50	180	3·77	8·84
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·87	4·93
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·91	6·65

RAINFALL TABLE FOR DECEMBER, 1914—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1914. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+4·21	297	1·40	9	24	25·11	25·72	+ ·61	102	25·11	Camden Square
+4·38	258	1·20	9	27	27·64	32·43	+4·79	117	27·64	Tenterden
+6·80	334	2·08	9	23	30·48	36·29	+5·81	119	30·48	Patching
+6·14	290	1·80	9	26	31·87	38·67	+6·80	121	31·87	Cadland
+2·95	243	·79	28	26	24·58	26·90	+2·32	109	24·58	Oxford
...	...	...	...	...	25·17	...	...	...	25·17	Croyland Abbey
+2·37	239	1·12	9	24	19·28	19·89	+ ·61	103	19·28	Shoeburyness
+3·79	277	1·24	28	22	25·40	26·66	+1·26	105	25·40	Westley
+3·44	267	1·18	28	26	23·73	24·45	+ ·72	103	23·73	Geldeston
+6·12	237	1·18	28	27	38·27	49·18	+10·91	129	38·27	Polapit Tamar
+3·75	202	·88	12	23	33·54	42·52	+8·98	127	33·54	Rousdon
+3·88	243	·79	28	23	29·81	31·60	+1·79	106	29·81	Stroud
+3·87	229	1·05	27	23	32·41	34·90	+2·49	108	32·41	Wolstaston
+2·72	202	1·00	28	23	28·98	24·57	—4·41	85	28·98	Coventry
+2·60	238	1·24	28	22	23·35	22·09	—1·26	95	23·35	Boston
+1·90	188	·53	27	25	24·46	21·60	—2·86	88	24·46	Hodsock Priory
+2·29	168	1·12	27	23	34·73	38·64	+3·91	111	34·73	Macclesfield
+2·00	164	·85	3	23	32·70	32·12	— ·58	98	32·70	Southport
+3·67	154	1·40	3	25	61·49	61·81	+ ·32	101	61·49	Arncliffe
+2·49	210	·72	28	17	26·87	27·16	+ ·29	101	26·87	Ribston Hall
+2·32	200	·43	12	27	26·42	24·75	—1·67	94	26·42	Hull
+1·44	159	·82	12	23	27·94	27·89	— ·05	100	27·94	Newcastle
+3·30	122	3·90	17	21	129·48	128·91	— ·57	100	129·48	Seathwaite
+3·49	174	·87	17	30	42·28	50·11	+7·83	119	42·28	Cardiff
+4·43	186	1·50	26	25	46·81	50·55	+3·74	108	46·81	Haverfordwest
+4·91	205	1·62	27	25	45·46	49·41	+3·95	109	45·46	Gogerddan
+3·80	234	1·20	3	24	30·36	31·26	+ ·90	103	30·36	Llandudno
+3·74	177	1·22	4	20	43·47	46·71	+3·24	107	43·47	Cargen
+2·47	187	1·18	12	23	33·76	29·11	—4·65	86	33·76	Marchmont
+3·70	167	1·50	30	23	49·77	52·58	+2·81	106	49·77	Girvan
+1·66	142	1·34	2	20	35·97	33·41	—2·56	93	35·97	Glasgow
+1·10	113	1·50	2	23	68·67	72·24	+3·57	105	68·67	Inveraray
+2·49	138	1·11	1	24	56·57	56·18	— ·39	99	56·57	Quinish
+1·75	166	1·22	13	17	28·64	26·78	—1·86	94	28·64	Dundee
+5·68	282	2·20	2	23	34·93	38·77	+3·84	111	34·93	Braemar
+2·15	163	1·00	13	17	32·73	30·54	—2·19	93	32·73	Aberdeen
...	...	...	...	...	29·33	...	...	...	29·33	Cawdor
+1·95	135	1·38	2	21	44·53	42·44	—2·09	95	44·53	Fort Augustus
+3·98	140	2·24	7	19	83·93	94·99	+11·06	113	83·93	Bendamph
+1·91	162	·97	13	15	31·90	31·82	— ·08	100	31·90	Dunrobin Castle
+ ·17	105	...	...	...	29·88	28·74	—1·14	96	29·88	Wick
+6·25	190	2·04	1	27	54·81	65·31	+10·50	119	54·81	Killarney
+5·32	224	1·65	3	22	39·57	41·70	+2·13	105	39·57	Waterford
+1·76	141	·82	1	28	39·43	41·85	+2·42	106	39·43	Castle Lough
+4·27	185	·90	1	28	46·52	55·74	+9·22	120	46·52	Emistymon
+5·16	250	1·36	25	23	34·99	36·96	+1·97	106	34·99	Courtown Ho.
+4·11	220	1·00	25	23	35·92	38·61	+2·69	108	35·92	Abbey Leix
+3·92	273	1·14	11	23	27·68	26·51	—1·17	96	27·68	Dublin
+3·82	212	1·10	28	21	36·15	39·34	+3·19	109	36·15	Mullingar
+2·64	143	1·01	1	28	52·87	55·09	+2·22	104	52·87	Enniscoe
+3·86	171	·87	1	28	48·90	54·91	+6·01	112	48·90	Cong
+2·57	159	·68	6	25	42·71	47·32	+4·61	111	42·71	Markree
+5·07	235	1·17	25	26	38·91	38·83	— ·08	100	38·91	Seaforde
+1·06	127	·58	4	21	37·56	35·36	—2·20	94	37·56	Dundarave
+2·74	170	1·20	20	24	39·38	41·59	+2·21	106	39·38	Omagh

SUPPLEMENTARY RAINFALL, DECEMBER, 1914.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	10·10	XI.	Lligwy	6·27
,,	Ramsgate	5·35	,,	Douglas	6·44
,,	Hailsham	9·23	XII.	Stoneykirk, Ardwell House...	6·35
,,	Totland Bay, Aston House...	9·07	,,	Dalry, The Old Garroch.....	..
,,	Stockbridge, Ashley..	8·53	,,	Beattock, Kinnelhead	8·66
,,	Grayshott	11·32	,,	Langholm, Drove Road	6·66
III.	Harrow Weald, Hill House...	6·91	XIII.	Meggat Water, Cramilt Lodge	2·50
,,	Caversham, Rectory Road ...	6·73	,,	North Berwick Reservoir.....	3·71
,,	Pitsford, Sedgebrook.....	5·46	,,	Edinburgh, Royal Observaty.	3·60
,,	Woburn, Milton Bryant.....	6·71	XIV.	Maybole, Knockdon Farm ...	4·22
,,	Chatteris, The Priory..... ...	5·07	XV.	Ballachulish House	17·46
IV.	Elsenham, Gaunts End	6·03	,,	Campbeltown, Witchburn ..	7·70
,,	Colchester, Hill Ho., Lexden	5·73	,,	Holy Loch, Ardnadam.....	11·15
,,	Ipswich, Rookwood, Copdock	6·12	,,	Islay, Eallabus	6·77
,,	Blakeney.....	4·86	,,	Tiree, Cornaigmore	7·35
,,	Swaffham	5·42	XVI.	Dollar Academy	7·85
V.	Bishops Cannings	5·42	,,	Balquhidder, Stronvar.....	13·50
,,	Wimborne, St. John's Hill ...	9·10	,,	Glenlyon, Meggernie Castle..	13·28
,,	Ashburton, Druid House.. ...	14·88	,,	Blair Atholl	7·91
,,	Cullompton	8·43	,,	Coupar Angus	6·69
,,	Lynmouth, Rock House	9·49	,,	Montrose, Sunnyside Asylum.	5·26
,,	Okehampton, Oaklands.. ...	11·82	XVII.	Alford, Lynturk Manse	6·19
,,	Hartland Abbey.....	5·81	,,	Fyvie Castle	4·40
,,	Probus, Lamellyn.....	8·73	,,	Keith Station	5·98
,,	North Cadbury Rectory.....	7·67	XVIII.	Rothiemurchus	5·79
VI.	Clifton, Pembroke Road.....	7·17	,,	Loch Quoich, Loan	20·40
,,	Ross, The Graig	6·48	,,	Drumnadrochit	6·40
,,	Shifnal, Hatton Grange.....	6·06	,,	Skye, Dunvegan	9·80
,,	Droitwich.....	5·82	,,	Lochmaddy, Bayhead	5·24
,,	Blockley, Upton Wold.....	7·16	,,	Glencarron Lodge	10·83
VII.	Market Overton.....	5·57	XIX.	Invershin	3·94
,,	Market Rasen	4·94	,,	Melvich	4·81
,,	Bawtry, Hesley Hall	3·81	,,	Loch Stack, Achfary	9·45
,,	Derby, Midland Railway.....	5·72	XX.	Skibbereen Rectory..... ..	11·35
,,	Buxton	8·17	,,	Dunmanway, The Rectory ..	14·02
VIII.	Nantwich, Dorfold Hall	6·27	,,	Glanmire, Lota Lodge.....	9·56
,,	Chatburn, Middlewood	6·24	,,	Mitchelstown Castle	7·95
,,	Cartmel, Flookburgh	...	,,	Darrynane Abbey.....	11·62
IX.	Langsett Moor, Up. Midhope	7·98	,,	Clonmel, Bruce Villa	9·58
,,	Scarborough, Scalby	4·82	,,	Newmarket-on-Fergus, Fenloe	6·49
,,	Ingleby Greenhow	6·87	XXI.	Laragh, Glendalough	6·83
,,	Mickleton	7·90	,,	Ballycumber, Moorock Lodge	5·24
X.	Bellingham, High Green Manor	7·37	,,	Balbriggan, Ardgillan	6·69
,,	Ilderton, Lilburn Cottage ...	5·53	XXII.	Woodlawn	6·76
,,	Keswick, The Bank.....	10·54	,,	Westport, St. Helens	8·76
XI.	Llanfrechfa Grange	9·07	,,	Dugort, Slievemore Hotel ..	10·66
,,	Treherbert, Tyn-y-waun	15·96	,,	Mohill Rectory	6·05
,,	Carmarthen, The Friary	10·15	XXIII.	Enniskillen, Portora.....	5·50
,,	Castle Malgwyn [Llechryd]...	...	,,	Dartrey [Cootehill]	6·53
,,	Crickhowell, Tal-y-maes.....	11·00	,,	Warrenpoint, Manor House ..	8·93
,,	New Radnor, Ednol	9·30	,,	Banbridge, Milltown	5·30
,,	Birmingham WW., Tyrmynydd	13·41	,,	Belfast, Cave Hill Road	7·36
,,	Lake Vyrnwy	9·51	,,	Glenarm Castle.....	10·07
,,	Llangyhanfal, Plâs Draw.....	7·49	,,	Londonderry, Creggan Res...	5·30
,,	Dolgelly, Bryntirion.....	10·43	,,	Dunfanaghy, Horn Head ...	7·19
,,	Bettws-y-Coed, Tyn-y-bryn...	12·32	,,	Killybegs	6·66

THAMES VALLEY RAINFALL —— DECEMBER, 1914.

Symons's Meteorological Magazine

Watershed of River Thames above Teddington, and River Lee above Feildes Weir

Rainfall Stations reporting

Isohyetals

WEATHER OF DECEMBER.

At the beginning of the month a large depression passed over the Kingdom in a north-easterly direction, causing unsettled weather generally. The heaviest rain fell in Scotland, and some stations in the Western Highlands recorded more than 1·00 in. on each of the first four days. On the 2nd 3·04 in. fell at Kenmore, 2·95 in. at Killin, and 2·94 in. at Meggernie Castle, and on the 3rd falls of 2·00 in. or more occurred at stations on both sides of the Irish Sea and as far north as Invergarry. A deep depression passed across the Kingdom from the west on the 4th, bringing squally weather. Southerly or south-westerly gales were experienced along the western coasts, and at Southport gusts blew at 88 miles per hour. The advance of further depressions from the Atlantic caused a continuance of the unsettled conditions and heavy rain fell daily in all districts. Temperature was above the average nearly everywhere, and the highest readings of the month occurred at most stations on the 6th or 7th. At Tottenham and Bath 57° was reached, and 50° was exceeded in all districts south of the Tweed. A depression which formed over the Bay of Biscay spread northwards on the 9th and occasioned freshening easterly winds and heavy rain over the south of England, more than 2·00 in. falling at many stations in the south-eastern counties. The south and east of Ireland experienced heavy rain on the 10th and 11th, when a depression hovered over the south-west of the Kingdom before passing away to the south-east. At Rathmines the fall of 1·62 in. on the 11th was accompanied by a heavy south-easterly gale. On the 13th more than 1·00 in. of rain fell over a great part of Scotland and at Lynturk it amounted to 2·40 in. Further heavy falls occurred on the 17th and 18th, when a low pressure system moved over the Kingdom from the west. Some high level stations in Wales and the Lake District had more than 3·00 in. of rain on either day, and at Seathwaite there was 3·90 in. on the 17th. Temperature remained high generally until the 19th, when it failed to reach 40° in some parts of Scotland and Ireland. On this day minima of 22° and 23° occurred at Balmoral and Crieff respectively. Glazed frosts were reported at Duns and West Witton on the 21st and 22nd. Anticyclonic conditions set in on the 22nd and temperature became low, falling to 7° at Balmoral on the 22nd. A large depression appeared off Ireland on the 25th and caused increasing southerly winds in the west and north with a renewal of the heavy rain. At Glendalough there was 2·07 in., and at Lochgoilhead 2·43 in. With the advance of this depression in an easterly direction rain fell heavily over the whole of the Kingdom. On the evening of the 28th the southern and midland counties of England experienced a destructive south-westerly gale accompanied by heavy rain and snow. More than 1·00 in. fell at most stations and there was 1·77 in. at Upton Wold and 1·75 in. at Melbourne.

In London the month was unprecedentedly wet, the total rainfall measured at Camden Square, 6·34 in., being the greatest recorded in that month in 57 years' record. Only three other months in that period had more rain, viz., June, 1878, August, 1878, and June, 1903. The mean temp., 42°·4, was 2°·7 above the average. The duration of sunshine was 26·9 hours, and of rain 117·5 hours, the latter being the greatest recorded in any month in the past 34 years. Evaporation ·05 in.

More than 10 in. of rain fell during the month over a large area in the south of England, and in Devon some stations had about 15 in. The fall diminished towards the east, and in the Isle of Thanet only 4 in. fell. In England the fall varied from about 4 in. in the estuary of the Humber to more than 20 in. in the Lake District, and at the Stye there was 27 in. In Scotland it ranged from 2 in. on the shores of the Moray Firth and 3 in. on the Firth of Forth, to 20 in. at Loan, in the Western Highlands. In Ireland there was less than 5 in. in the extreme north, but more than 10 in. in the south and south-east, and 18 in. at the Gap of Dunloe.

The general rainfall, as a percentage of the average, was as follows :— England and Wales, 201 ; Scotland, 152 ; Ireland, 187 ; British Isles, 183.

Climatological Table for the British Empire, July, 1914.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	93·7	1	47·3	30	74·6	55·6	56·3	78	133·8	42·2	1·26	15	7·5
Malta	89·2	17	66·5	19	78·5	67·6	...	74	138·0	...	·00	0	0·3
Lagos	88·0	23	68·0	30	82·8	73·1	71·5	83	154·1	64·0	9·68	18	9·3
Cape Town	79·3	11	35·3	1	65·3	47·8	48·7	75	...	...	4·30	11	4·3
Natal, Durban ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	70·9	29	35·4	11	62·4	42·0	34·0	59	..	27·2	·00	0	0 1
Mauritius	78·3	6	54·0	23	74·6	62·3	60·3	77	...	46·0	2·52	22	4·9
Bloemfontein	...	...	...	...	...	...	...	...	...	...	...	...	...
Calcutta...	92·0	1, 9	76·8	7	87·8	79·5	78·3	87	...	75·0	16·78	20	9·1
Bombay...	89·4	2	74·9	24	84·8	78·7	77·5	87	130·8	67·6	31·12	31	8·8
Madras	104·1	1, 6	75·6	15	96·6	79·6	71·3	66	157·4	73·9	2·60	19	8·2
Colombo, Ceylon ...	87·4	20	72·7	7	86·0	77·0	74·6	80	156·5	70·8	3·76	17	7·2
Hongkong	92·2	25	74·4	30	86·9	78·1	76·1	83	...	...	26·31	17	6·9
Sydney	63·5	3	39·3	16	58·3	47·4	43·5	73	109·2	30·0	8·76	15	5·2
Melbourne	65·4	25	31·5	21	54·9	41·0	40·0	72	114·9	22·9	1·84	16	6·0
Adelaide	70·0	25	35·8	20	60·5	44·4	42·4	69	125·9	23·9	1·39	14	5·3
Perth	68·3	19	37·2	5	62·1	46·3	46·5	75	131·3	28·9	4·44	18	4·7
Coolgardie	71·2	20	33·4	6	61·5	41·8	39·7	61	134·0	24·4	·72	9	4·2
Hobart, Tasmania ..	60·5	26	31·1	22	51·2	39·3	37·0	70	108·3	24·1	2·57	23	5·9
Wellington ...	57·4	8	31·2	5	53·1	42·7	41·3	78	108·6	23·0	2·49	15	6·7
Auckland	62·5	7	36·5	18	55·8	44·6	45·0	83	129·0	32·0	4·08	23	6·0
Jamaica, Kingston ..	95·3	28	71·6	30	91·6	74·3	69·6	68	...	...	·18	5	2·7
Grenada	87·0	24	72·0	*13	84·0	74·5	...	80	136·0	...	6·72	25	4·5
Toronto	92·6	11	47·9	20	80·5	60·4	59·0	70	143·0	44·0	1·00	11	4·4
Fredericton	89·0	15	40 0	2	77·0	50·4	...	72	...	...	2·37	10	4·8
St. John, N.B. ...	75·7	25	47·0	2	66·7	52·3	54·0	80	...	...	2·52	10	5·3
Alberta, Edmonton ...	87·9	3	41·3	29	76·3	53·3	...	64	139·8	35·8	2·69	11	4·5
Victoria, B.C.	80·3	17	48·2	6	67·6	51·8	49·0	71	...	...	·00	0	3·2

* 29

Johannesburg.—Bright sunshine 314·5 hours.

Mauritius.—Mean temp. of air 0·4, dew point 0·6 above, and R ·13 in. below, averages. Mean hourly velocity of wind 11·1 miles.

COLOMBO, CEYLON.—Mean temp. of air 81·5, or 0·4, dew point 0·4, above, and R 1·69 in. below, averages. Mean hourly velocity of wind 5·0 miles.

HONGKONG.—Mean temp. of air 81·9. Mean hourly velocity of wind 11·5 miles. Bright sunshine 180 1 hours.

Melbourne.—Mean temp. of air 0·5 below, and R normal.

Adelaide.—Mean temp. of air 0·9 above, and R 1·25 in. below, averages.

Coolgardie.—Temp. of air 0·7 above, and R slightly below, average.

Hobart.—Temperature practically normal.

Wellington.—Mean temp. of air 47°·9 or 0·4 above, and R 3·35 in. below, averages. Bright sunshine 117·8 hours. Frosts on nine days.

Auckland.—Rainfall ·87 in. below average.

ALBERTA, EDMONTON.—Warm, sunny and dry month. TSS on 11 days. Hai 1 in. in diameter.